LOKEE TESTING Laboratory

United States
Environmental Protection Agency
Wood Heater Certification Test Report

Jotul North America

C350

Volume 1 of 1

13235 Prairie Circle East, Sumner, Washington 98390
Telephone: 360-897-9685

United States
Environmental Protection Agency
Wood Heater Quality Assurance Test Report

Jotul North America
55 Hutcherson Drive
Gorham, ME 04038
C350

Volume 1 of 1

Report By:

Chip Wadington
Kent Venton

CONFIDENTIAL

RELEASED ONLY BY
AUTHORIZED PERSONNEL

8/12/2006

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TEST SERIES INFORMATION

Unit name and model number: C350

Type of unit: Wood Heater

Manufacturer: Jotul North America
Address: 55 Hutcherson Drive
Gorham, ME 04038

Contact: Roger Purinton
Phone Number: 1-207-591-6621
Fax Number: 1-207-772-0523

Observers: None

Date Received: 6/16/2006 Aged:6/22-26/2006 Dates Tested: 7/28,29,31,-8/1/2006

Tested by: LoKee Testing Lab using EPA Methods 28, 28A and 5H where applicable.

Test Location: 13235 Prairie Circle East
Bonney Lake, WA 98391
Test Site Elevation: 500 feet above sea level

LoKee's Field Team

Team Members: Chip Wadington
Kent Venton

The following pages contain (1) test unit storage information, (2) a diagram showing the height and location of the stack components and sampling ports, and (3) copies of the certification test notices and cancellations sent to the EPA.

STOVE STORAGE INFORMATION

1. **Temporary Storage at LoKee**

   A single, steel, banding strap is place around the unit, preventing opening of the loading door.

2. **Permanent Storage**

   After certification is granted, additional banding is placed both horizontally and vertically around the unit to prevent access to the interior of the unit. An address label is then taped over the intersecting bands to act as a seal. Warning labels are affixed on the unit. The unit is then shipped via common carrier to the manufacturer's designated storage facility unless otherwise noted. A sample of the warning label follows.

WARNING

SEALED EPA TEST UNIT

DO NOT TAMPER WITH SEALS
TO DO SO WILL VOID CERTIFICATION

JOTUL NORTH AMERICA
C350

LOKEE TESTING Laboratory

13235 PRAIRIE CIRCLE EAST, BONNEY LAKE, WA 98391
TELEPHONE: 360-897-9685

July 7, 2006

Mr. John Dupree
Federal Programs Section
U.S. EPA
Stationary Source Compliance Division
Mail Code 2223A Room #7124
1200 Pennsylvania Avenue NW
Washington, DC 20460

Mr. Dupree:

This is a request to waive the 30 notification for testing in order run certification tests on the:

Jotul North America:
Model C350

If you have any questions please feel free to call.

Sincerely,

Chip Wadington
Owner

LOKEE TESTING Laboratory

13235 PRAIRIE CIRCLE EAST, BONNEY LAKE, WA 98391
TELEPHONE: 360-897-9685

July 7, 2006

Mr. John Dupree
Federal Programs Section
U.S. EPA
Stationary Source Compliance Division
Mail Code 2223A Room #7138
1200 Pennsylvania Avenue NW
Washington, DC 20460

Mr. Dupree:

On July 7, 2006 at 13:00 am PST, Irvin Keefer waived the 30 day intent to certify notice at the request of LoKee Testing Laboratory in order to run certification tests on the:

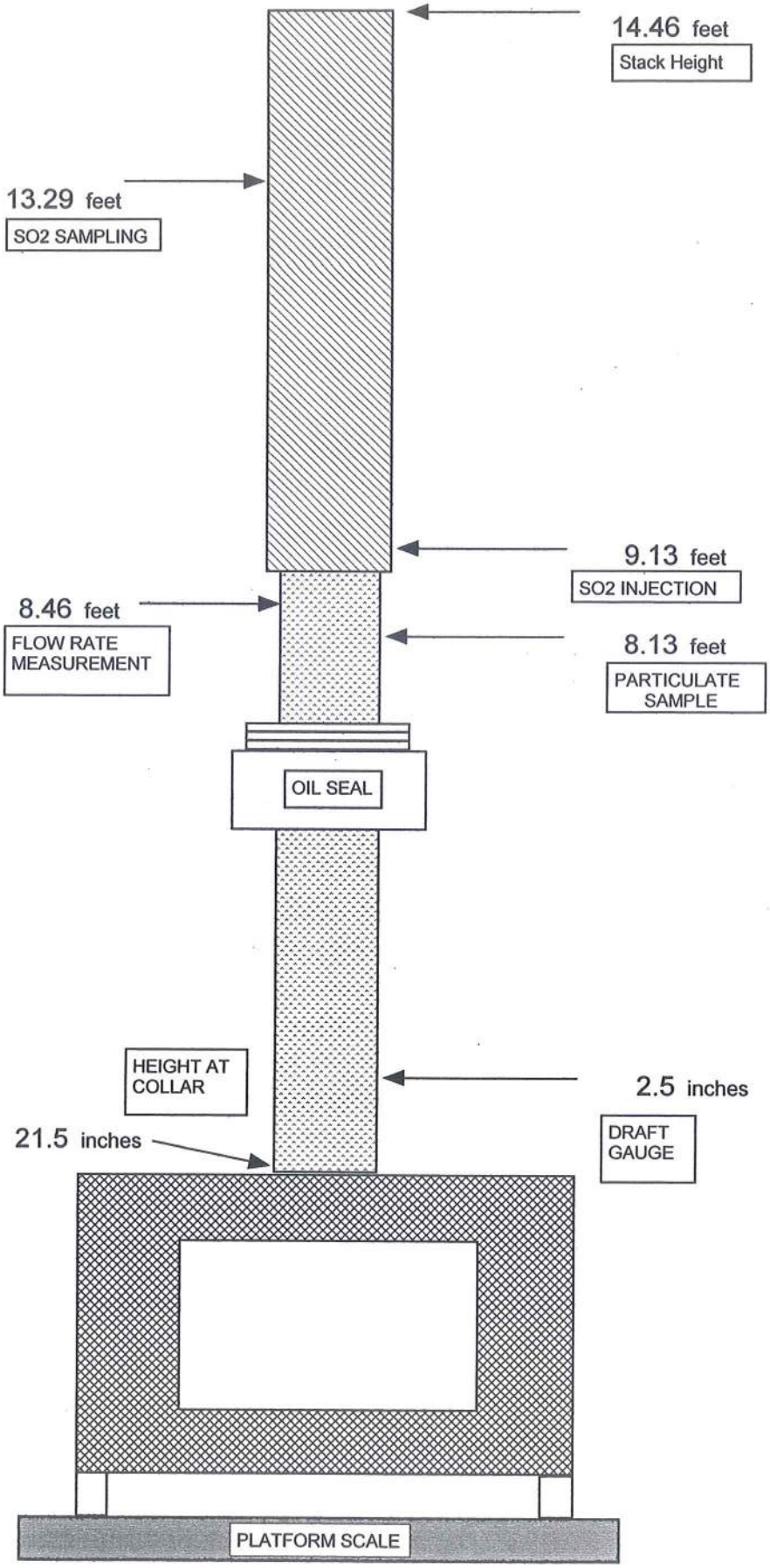
Jotul North America :
Model C350

If you have any questions please feel free to call.

Sincerely,

Chip Wadington
Owner

Model: C350 **Date:** 08/01/06



AGING DATA SHEET

UNIT: Jotul C350 DATE: 6-22-06

Hr #	DATE	TIME	TEMP Fbox 1	TEMP Top Box 2
1	6-22-06	1220	1003	806
2	"	1320	591	427
3	"	1420	620	584
4	"	1520	717	470
5	"	1620	574	366
6	6-23-06	1215	1021	788
7	"	1315	866	671
8	"	1415	834	399
9	6-26-06	1025	1035	756
10	"	1125	907	630
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				

Hr #	DATE	TIME	TEMP 1	TEMP 2
26				
27				
28				
29				
30				
31				
32				
33				
34				
35				
36				
37				
38				
39				
40				
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				

COMMENTS:

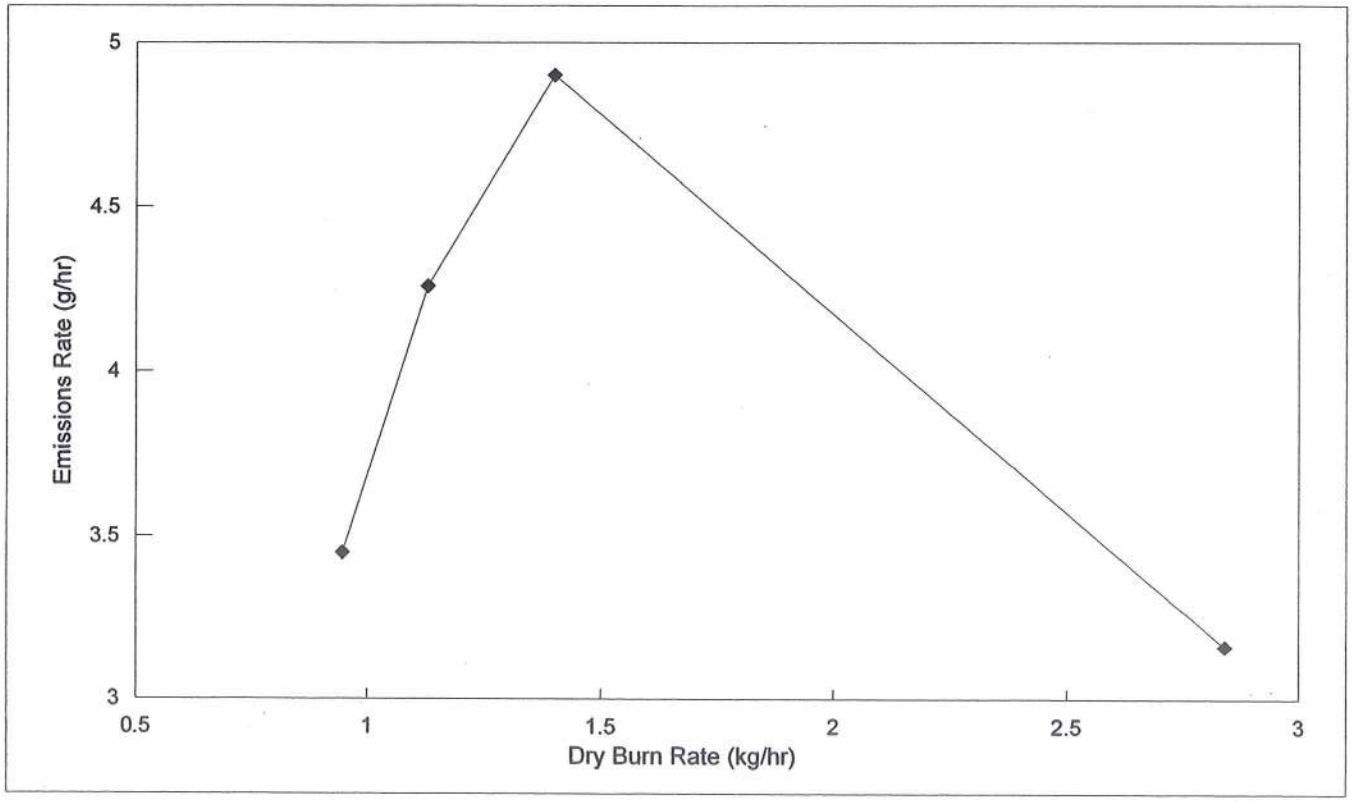
Data
Summary

Wood Heater Emission Test Summary

Laboratory/Wood Heater Information

Stove Manufacturer:	**Jotul**
Model Identification:	**C350**
Stove Type> 1=cat, 2=noncat, 3=pellet:	**2**
Laboratory Name:	**LoKee Testing Laboratory**
Laboratory Contact:	**Chip Wadington**
Telephone no.:	**360-897-9685**
Test Dates:	**July 28 thru August 1,2006**
Test Methods Used	
Method 28/Other:	**28**
Sampling Method:	**5H**

Run no.	Burn Rate (kg/hr)	Emission Rate (g/hr)	Heat Output (Btu/hr)	Wtd Avg (g/hr) 4.02
1	0.95	3.45	11419	
2	1.13	4.26	13626	
3	1.40	4.90	16881	
4	2.84	3.16	34245	
			NA	
			NA	



DATA SUMMARY

Unit: Jotul-C350

	RUN #	1	2	3	4				
Particulate Emissions:									
Concentration:	grains/dscf:	.1137	.1260	.1214	.0525				
Emissions Rate	grams/hr:	3.45	4.26	4.90	3.16				
Emissions Factor	grams/kg:	3.64	3.77	3.50	1.11				
Front Half Catch	% of total	54.8	48.0	52.8	55.1				
Total Mass Captured	total catch:	.4679	.4701	.3278	.0713				
Heat Output (EPA Default):	BTU/hr	11431.2	13637.8	16857.4	34281.5				
Fuel Burn Rates:									
Average kg/hr (dry)	Kg/hr	.95	1.13	1.40	2.84				
Fuel Moisture Content:									
Kindling (wet basis)	%	11.9697	13.669	13.917	11.739				
Pretest Fuel (wet basis)	%	17.424	16.655	16.201	17.188				
Test Fuel (wet basis)	%	17.11	17.372	17.338	17.825				
Air to Fuel Ratio		-	-	-	-				
Average Stack Gas									
Avg CO_2	%	5.24	5.84	6.20	9.35				
Avg O_2	%	-	-	-	-				
Avg CO	%	.73	.65	.56	.36				
Avg Moisture	%	4.50	5.22	6.04	8.28				
Avg Stack Gas Emissions:									
CO	g/Kg	120.04	100.25	83.93	39.31				
	g/hr	113.68	113.38	117.33	111.76				

Unit: Jotul-C350

	RUN #	1	2	3	4				
Avg Stack Gas Flow Rate									
EPA CMB	dscfm	7.80	8.70	10.39	15.48				
Tracer Gas	dscfm	6.988	9.591	9.928	11.589				
Draft (static)	in H_2O	-.037	-.044	-.052	-.066				
Proportionality Average	%	100	100	100	100	100	100	100	100
Average Temperatures									
Stack Gas	°F	214	226	268	444				
Firebox	°F	555	719	775	870				
Secondary	°F	718	801	878	1124				
Catalytic Combustor	°F	-	-	-	-				
Top	°F	406	447	524	627				
Left Side	°F	238	249	280	310				
Back	°F	275	296	347	313				
Right Side	°F	299	325	368	415				
Bottom	°F	326	323	416	375				
Temperature Change	°F	-47.5	-34.7	-51.4	35.5				
Test Chamber Enviroment									
Average Barometer	in. Hg	30.04	30.07	30.06	30.15				
Average Temperature	°F	80	73	79	84				
Ambient Moisture	% H_2O	1.35	1.25	1.28	1.5				
Relative Humidity	%RH	34	46.0	40.5	46				
Air Velocity	m/sec	0	0	0	0	0	0	0	0
Fuel Weight and Burn Time									
Density (dry basis)	gm/cm^3	-	-	-	-				
Coal Bed Weight	lbs	2.0	2.2	2.1	2.2				
Pre Test Fuel (inc kindling)	lbs	32.8	30.9	32.8	32.7				
Test Fuel	lbs	8.4	8.8	8.7	8.9				
Burn Time	min	200	175	140	70				

MINIMUM
DBR

CLIENT : Joyul TEST No. : 1

MODEL: C350 DATE: 28-Jul-06

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	516.500	0.150	84	0.66	5.30	525
5	518.000	0.230	84	0.30	3.50	425
10	519.901	0.150	84	0.46	2.80	525
15	521.439	0.150	85	0.36	3.40	525
20	522.983	0.150	85	0.43	3.10	525
25	524.527	0.150	85	0.51	3.20	525
30	526.072	0.150	85	0.64	6.00	525
35	527.616	0.170	85	0.52	5.30	500
40	529.238	0.180	85	0.53	7.60	475
45	530.945	0.170	85	0.49	6.70	500
50	532.567	0.210	85	0.36	7.80	450
55	534.368	0.210	85	0.29	9.50	450
60	536.170	0.230	85	0.22	9.30	425
65	538.077	0.210	85	0.24	9.80	450
70	539.879	0.210	85	0.25	9.20	450
75	541.681	0.200	86	0.16	9.10	450
80	543.489	0.200	86	0.14	8.60	450
85	545.298	0.200	87	0.23	7.70	450
90	547.113	0.200	87	0.36	8.60	450
95	548.928	0.180	87	0.47	6.80	475
100	550.647	0.150	87	0.70	5.30	525
105	552.204	0.160	88	0.84	5.10	500
110	553.843	0.160	88	0.91	5.00	500
115	555.483	0.160	89	0.84	5.00	500
120	557.129	0.160	89	0.97	4.70	500
125	558.777	0.160	89	1.07	4.50	500
130	560.424	0.160	89	0.99	4.10	500
135	562.071	0.180	89	1.18	3.80	475
140	563.805	0.180	89	1.27	3.70	475
145	565.540	0.180	89	1.33	3.60	475
150	567.274	0.160	89	1.21	3.60	500
155	568.921	0.160	89	1.23	3.60	500
160	570.568	0.160	89	1.19	3.60	500
165	572.216	0.160	89	1.12	3.50	500
170	573.863	0.150	89	1.10	3.30	525
175	575.433	0.150	89	1.07	3.30	525
180	577.002	0.150	89	1.08	3.30	525

185	578.571	0.150	89	1.00	3.30	525
190	580.140	0.150	89	0.99	3.20	525
195	581.709	0.150	89	1.00	3.10	525
200	583.278	0.150	89	1.03	3.10	525

CLIENT : Joyul TEST No. 1

MODEL: C350 DATE: 28-Jul-06

****

METER CAL. FACTOR (Y) -------	0.981		Wt. WOOD BURNED(LB) -------	8.4	Lbs
BAROMETRIC PRESS.(Pb) -------	30.04	in Hg	WET,FUEL MOISTURE % -------	17.11	%
LEAK RATE POST (Lp) -------	0.002	cfm	Wt. PART. COLLECTED -------	0.4679	g
WATER VOL. (V1c) -------	63.6	Ml	METER VOLUME Vm -------	66.778	mcf
TEST TIME (MIN) -------	200	min	HC MOLE FRACTION -------	0.0132	

CLIENT : Joyul TEST No. 1

MODEL: C350 DATE: 28-Jul-06

****

AVG DELTA H	-------	0.17	in H2O	AVG PRCNT CO	-------	0.73	%
AVG METER TEMP. Tm	-------	87	deg F	AVG PRCNT CO2	-------	5.24	%
AVG PPM SO2	-------	492	PPM	AVG BAL CO2/CO	-------	7.23	%

CLIENT : Joyul TEST No. 1

MODEL: C350 DATE: 28-Jul-06

****

STD SAMPLE VOL. Vm(std) d) ------	63.52	dscf	STACK GAS FLOW Qsd -------	467.974	dscf/Hr &
				7.80	dscf/min
VOL. WATER VAPOR Vw(s td) -----	2.994	scf	PARTICULATE CONCTRT. C s ------	0.0074	g/dscf
PRCNT MSTR Bws -------	4.50	%	PARTC.EMISS. RATE E -------	3.45	g/Hr
BURN RATE BR -------	0.95	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.58	Lb-mole/Lb
CO EMISSION RATE -------	113.68	g/Hr &	PART.EMISS. RATE ------	3.64	g/Kgdry fuel
	120.04	g/Kgdry fuel			

CLIENT : Joyul TEST No. : 1

MODEL: C350 DATE: 28-Jul-06

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR	PROPRTN RATE VAR. AVERAGE
5	753.2	97	100
10	772.9	99	
15	771.6	99	
20	773.9	100	
25	773.9	100	
30	774.4	100	
35	773.9	100	
40	774.3	100	
45	774.2	100	
50	774.3	100	
55	773.9	100	
60	774.3	100	
65	773.9	100	
70	774.3	100	
75	773.6	100	
80	775.4	100	
85	775.2	100	
90	777.0	100	
95	777.0	100	
100	776.8	100	
105	776.8	100	
110	778.1	100	
115	777.9	100	
120	780.0	100	
125	781.0	101	
130	780.5	100	
135	780.5	100	
140	780.7	100	
145	781.1	101	
150	780.7	100	
155	780.5	100	
160	780.5	100	
165	781.0	101	
170	780.5	100	
175	781.2	101	
180	780.7	101	
185	780.7	101	

190	780.7	101
195	780.7	101
200	780.7	101

COMPUTER INPUT DATA SHEET #1

Client: Total North America

Address: 55 Hutcherson Drive
Gorham, ME 04038

Phone: 1-800-797-5912 Fax: 1-207-772-0523

Run No.: 1 Date of Test: 7-28-06 Burn Rate: .947 3,09/8

Model No.: C350 ☒ min ☐ min-1.25 ☐ fan

Stove Type: ☐ Cat ☒ Non Cat ☐ Pellet ☐ 1.25-1.9 ☐ max ☐ insert

Dry Gas Meter Y Factor: .981 (0.000) (Data Sheet #2) Post Leak Rate: .002 cfm (.000) (Data Sheet #2) Time: 200 min. (000) (Data Sheet #2)

Dry Gas Meter Volume: 66.778 cf (00.000) (Data Sheet #2)

Stack Flow: 6.988 dscfm (00.000) (Data Sheet #2) Δ H: .172 in. H_2O (.000) (Data Sheet #2)

Maximum Vac.: 2.0 (0.0) (Data Sheet #2) Barometric Pressure: 30.04 in. Hg (00.00) (Data Sheet #2)

H_2O Captured: 63.6 g (00.0) (Data Sheet #3)

Front Half Catch % Of Total: 54.8 % (00.0) (Data Sheet #6) Total Particulate Catch: .4679 g (0.0000) (Data Sheet #6)

Flue Gas Moisture: 4.5030 % (00.000) (Data Sheet #7)

Particulate Emission: .1137 gr/dscf (0.0000) (Data Sheet #7)

Relative Humidity: 34 % RH (00.0) (Data Sheet #8) Ambient Moisture: 1.35 % H_2O (0.00) (Data Sheet #8)

Preburn Fuel Wt.: 32.8 lbs. (00.0) (Data Sheet #8) Coal Bed Wt.: 2.0 lbs. (00.0) (Data sheet #8) Test Fuel Wt.: 8.4 lbs. (00.0) (Data sheet #8)

Heat Output (EPA Default): 11431.2 BTU/hr (00,000.0) (Data Sheet #8)

Kindling Fuel % Moisture (wet): 11.997 % (00.000) (Data Sheet #10) Pretest Fuel % Moisture (wet): 17.424 % (00.000) (Data Sheet #10)

Test Fuel % Moisture (dry): 20.642 % Test Fuel % Moisture (wet): 17.190 % (00.000) (Data Sheet #10 [wood stove] or #11 [pellet stove])

Fuel Higher Heating Value (dry): ____ BTU/lb. (0000) (Data Sheet #11)

Stack Static Pressure: -.037 in. H_2O (+/- .000) (Data Sheet #12)

Average Ambient Temperature: 80 °F (00) (Data Sheet #14) Stove Temperature Change: -47.5 °F (+/- 000.0) (Data Sheet #14)

Start time = 1335
End time = 1655

Meter Temp = 547

METER BOX DATA SHEET PAGE # 2

Page: 1 of 2

UNIT: John C350 RUN: 1 DATE: 7-28-06

Meter Box: 5H Y Factor: .981

Leak checks: 15 " Hg @ .000 cfm _____ " Hg @ _____ cfm

15 " Hg @ .002 cfm _____ " Hg @ _____ cfm

Inject SO^2 @ 100 cc/min. Nozzle: Probe @ 3/8 " od Initial Volume: 1,500

ROTO: PRESS: .17			SAMPLING RATIO: 21.5 : 1				BP: 30.05		
MIN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
0	1335	516.500	——	6.561	.15	84	525	84	1.0
5	40	518.000	——	8.105	.23	84	425	84	2.0
10	45	519.901	519.901	6.561	.15	84	525	84	2.0
15	50	521.439	521.439	6.549	.15	85	525	85	2.0
20	55	522.983	522.983	6.549	.15	85	525	85	2.0
25	1400	524.527	524.527	6.549	.15	85	525	85	2.0
30	05	526.072	526.072	6.549	.15	85	525	85	2.0
35	10	527.616	527.616	6.876	.17	85	500	85	2.0
40	15	529.238	529.238	7.238	.18	85	475	85	2.0
45	20	530.945	530.945	6.876	.17	85	500	85	2.0
50	25	532.567	532.567	7.640	.21	85	450	85	2.0
55	30	534.368	534.368	7.640	.21	85	450	85	2.0
ROTO PRESS: .17			TOTALS:	83.693	2.07	1017	BP.: 30.05		
60	1435	536.170	536.170	8.090	.23	85	425	85	2.0
65	40	538.077	538.077	7.640	.21	85	450	85	2.0
70	45	539.879	539.879	7.640	.21	85	450	85	2.0
75	50	541.681	541.681	7.626	.20	86	450	86	2.0
80	55	543.489	543.489	7.626	.20	86	450	86	2.0
85	1500	545.298	545.298	7.612	.20	87	450	87	2.0
90	05	547.113	547.113	7.612	.20	87	450	87	2.0
95	10	548.928	548.928	7.212	.18	87	475	87	2.0
100	15	550.647	550.647	6.525	.15	87	525	87	2.0
105	20	552.204	552.204	6.839	.16	88	500	88	2.0
110	25	553.843	553.843	6.839	.16	88	500	88	2.0
115	30	555.483	555.483	6.826	.16	89	500	89	2.0
			TOTALS:	88.087	2.26	1040	MAX VACC =		
TOTAL Cu Ft.			TOTALS:	171.780	4.33	2057	AVG. BP:		

METER BOX DATA SHEET PAGE # 2

Page: 2 of 2

UNIT: Sotol C350 RUN: 1 DATE: 7-28-06

Meter Box: SH Y Factor: .981

Leak checks: 15 " Hg @ .000 cfm _____ " Hg @ _____ cfm

15 " Hg @ .002 cfm _____ " Hg @ _____ cfm

Inject SO^2 @ 100 cc/min. Nozzle : Probe @ 3/8 " od Initial Volume: 1.500

ROTO: PRESS: .17			SAMPLING RATIO: 21.5 : 1				BP: 30.02		
MIN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	1535	557.129	557.129	6.819	.16	89	500	89	2.0
125	40	558.777	558.777	6.819	.16	89	500	89	2.0
130	45	560.424	560.424	6.819	.16	89	500	89	2.0
135	50	562.071	562.071	7.178	.18	89	475	89	2.0
140	55	563.805	563.805	7.178	.18	89	475	89	2.0
145	1600	565.540	565.540	7.178	.18	89	475	89	2.0
150	05	567.274	567.274	6.819	.16	89	500	89	2.0
155	10	568.921	568.921	6.819	.16	89	500	89	2.0
160	15	570.568	570.568	6.819	.16	89	500	89	2.0
165	20	572.216	572.216	6.819	.16	89	500	89	2.0
170	25	573.863	573.863	6.495	.15	89	525	89	2.0
175	30	575.433	575.433	6.495	.15	89	525	89	2.0
ROTO PRESS: .17			TOTALS:	82.257	1.94	1068	BP.: 30.02		
180	1635	577.002	577.002	6.495	.15	89	525	89	2.0
185	40	578.571	578.571	6.495	.15	89	525	89	2.0
190	45	580.140	580.140	6.495	.15	89	525	89	2.0
195	50	581.709	581.709	6.495	.15	89	525	89	2.0
200	55	583.278	583.278	6.495	.15	89	525	89	2.0
205				32.475	.75	445			
210				(114.732)	(2.71)	(1513)			
215									
220									
225									
230									
235						3570			
			TOTALS:	286.512	7.04	87	MAX VACC =		2.0
TOTAL Cu Ft.		66.778	TOTALS:	6.988	.172	547	AVG. BP:		30.04

÷41

PARTICULATE CATCH / MOISTURE DATA SHEET # 3

UNIT : Jotul C350 RUN : 1 DATE : 7-28-06

SCALE CHECK	LEVEL	ZEROED
INITIAL :	✓	✓
FINAL :	✓	✓

SCALE	WEIGHT
295.0 g	295.0
590.0 g	590.0
885.0 g	885.0

IMPINGER	#1	#2	#3	#4
FINAL WT	652.0	576.5	485.4	906.9
INITIAL WT	601.3	573.3	483.3	899.3
NET WT GRAMS	50.7	3.2	2.1	7.6

TOTAL CATCH : 63.6 GRAMS H_2O

FRONT HALF

FILTER #	69F	
FINAL WT g	.8731	
INITIAL WT g	.6702	
NET WT g	.2029	

BEAKER #	181
DESC.	ACETONE
FINAL WT g	103.9317
INITIAL WT g	103.8775
NET WT g	.0542
VOL. DESC. ml	75

BACK HALF

FILTER #	69B	
FINAL WT g	.3736	
INITIAL WT g	.3362	
NET WT g	.0374	

BEAKER #	182	183	184	185	
DESC.	ACETONE	METHCHLOR	H_2O	H_2O	
FINAL WT g	103.2273	103.8252	104.2147	104.6555	
INITIAL WT g	103.1320	103.8053	104.1709	104.6353	
NET WT g	150	.0199	.0438	.0202	(.0640)
VOL. DESC ml	.0953	75	150	90	(240)

FILTER TARE WEIGHTS DATA SHEET #4-1

Into Dessicator : Date : 10-27-05 Time : 9:30 By : KV

Manufacturer S & S Grade : # 25 Glass Front Size : 11 cm Lot No. : ZB921

Back Size: 8.2 cm Lot No. : B1044632

	DATE: 10-31	BY: KV	DATE: 11-1	BY: KV	DATE: 11-2	BY: KV
FILTER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
61 F	.6707	0936	.6708	0922	/	
62 F	.6645	0936	.6647	0923	/	
63 F	.6641	0937	.6642	0923	/	
64 F	.6703	0937	.6706	0924	/	
65 F	.6688	0938	.6689	0924	/	
66 F	.6628	0939	.6629	0925	/	
67 F	.6700	0939	.6704	0925	/	
68 F	.6676	0940	.6679	0926	/	
69 F	.6699	0940	.6702	0926	/	
70 F	.6683	0941	.6688	0927	/	
61 B	.3357	0926	.3378	0906	.3381	0927
62 B	.3399	0920	.3398	0906	-	
63 B	.3395	.0921	.3394	0907	/	
64 B	.3363	.0922	.3360	0907	-	
65 B	.3359	.0923	.3361	0908	-	
66 B	.3361	.0924	.3366	0908	-	
67 B	.3363	0925	.3364	0909	-	
68 B	.3384	0926	.3383	0909	-	
69 B	.3364	0927	.3362	0910	-	
70 B	.3387	0928	.3386	0910	-	

Checked by: C. Washington Date: 11-2-05 Time: 1055

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH
10-31	0915	KV	63	78	45
11-1	0906	KV	64	78	45
11-2	0927	KV	60	74	48

BEAKER TARE WEIGHTS DATA SHEET #4-2

Into Dessicator: Date : 11-25-05 Time : 1015 By : CP W.

	DATE: 11-27-05	BY: KW	DATE: 11-28-05	BY: CP	DATE:	BY:
BEAKER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
176	105.2089	1150	105.2094	1015	✓	
177	105.0934	1151	105.0939	1016	✓	
178	104.0207	1152	104.0211	1017	✓	
179	103.9995	1153	104.0000	1018	✓	
180	104.1371	1153	104.1375	1020	✓	
181	103.8770	1154	103.8775	1021	✓	
182	103.1315	1154	103.1320	1022	✓	
183	103.8049	1155	103.8053	1023	✓	
184	104.1704	1155	104.1709	1024	✓	
185	104.6349	1156	104.6353	1025	✓	
186	106.0933	1157	106.0938	1027	✓	
187	105.5771	1157	105.5775	1029	✓	
188	104.8050	1158	104.8055	1030	✓	
189	103.2081	1158	103.2085	1031	✓	
190	103.8495	1200	103.8500	1032	✓	
191	104.5248	1200	104.5252	1034	✓	
192	103.4592	1201	103.4595	1035	✓	
193	101.9848	1201	101.9852	1036	✓	
194	103.9911	1203	103.9916	1037	✓	
195	105.4652	1206	105.4653	1038	✓	
196	104.8893	1207	104.8898	1039	✓	
197	104.9687	1207	104.9690	1040	✓	
198	104.5900	1208	104.5905	1041	✓	
199	106.2448	1209	106.2452	1044	✓	
200	104.7527	1209	104.7530	1045	✓	

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH	
11-27-05	11:45	KV	59	73	43	Checked by : KV
11-28-05	1000	CP	58	72	42	Date : 11-30
						Time : 0955

WOODSTOVE DATA SHEET # 4-3 : CONSTANT WEIGHTS

UNIT : Jotul C350 RUN : 1 DATE : 7-28-06 Page : 1 of

Beaker #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
181	7-29	1600	CP	103.9322	7-30	1408	CP	103.9317	7-31	0834	CP				
182	7-29	1600	CP	103.2277	7-30	1409	CP	103.2273	7-31	0837	CP				
183	7-29	1600	CP	103.8257	7-30	1410	CP	103.8252	7-31	0838	CP				
184	7-29	1600	CP	104.2151	7-30	1411	CP	104.2147	7-31	0839	CP				
185	7-29	1600	CP	104.6559	7-30	1412	CP	104.6555	7-31	0840	CP				

Filter #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
69F	7-28	1800	CP	.8733	7-29	1550	CP	.8731	7-30	1905	CP				
69B	7-28	1800	CP	.3764	7-29	1551	CP	.3741	7-30	1906	CP	.3736	7-31	0835	CP

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	DB	%RH
1	7-29	1545	CP	77	46
2	7-30	1900	CP	75	48
3	7-31	0830	CP	77	42
4					
5					

Weighing Session	Date	Time	By	DB	%RH
6					
7					
8					
9					
10					

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 6-1-2006 Through	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
100.0001	9.9999	1.0000	.0999	CP	6-1	1020	78	43
100.0002	10.0000	.9999	.0999	CP	6-2	1810	75	48
100.0002	10.0000	.9998	.1000	LW	6-5	1300	76	45
100.0002	10.0001	1.0000	.0999	CP	6-6	0900	76	46
99.9996	10.0001	1.0000	.0998	CP	6-7	1015	76	49
100.0000	10.0002	1.0000	.0998	CP	6-12	915	77	46
99.9996	9.9999	1.0000	.0999	CP	6-13	1235	78	46
100.0003	9.9999	1.0001	.0999	CP	6-14	1230	76	49
100.0004	10.0001	1.0001	.1000	CP	6-15	0840	75	48
99.9999	10.0001	1.0002	.0998	CP	6-16	1020	77	48
99.9998	10.0001	1.0000	.0999	CP	7-29	1545	77	46
100.0000	10.0001	.9997	.0999	CP	7-30	1900	75	48
99.9997	10.0000	1.0000	.0999	CP	7-31	0830	77	42
99.9996	10.0002	1.0001	.0998	CP	8-1	1100	78	46
100.0000	10.0001	1.0000	.1000	CP	8-2	1800	77	49
99.9998	10.0001	1.0001	.0998	CP	8-3	1140	76	49
99.9998	10.0003	.9999	.0999	CP	8-4	2030	76	49
100.0000	10.0002	.9999	.0999	CP	8-5	1130	76	45

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 12-8-2005 Through 5-31-2006	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	.9999	.0998	Clp	12-8	0900	67	38
100.0001	10.0001	1.0000	.0998	Clp	12-27	1500	77	49
100.0000	10.0002	1.0000	.0999	KV	12-28	1125	70	48
100.0004	10.0003	1.0000	.1000	KV	12-29	1000	74	44
99.9999	10.0002	1.0000	.0999	KV	12-30	1030	76	42
99.9998	10.0002	1.0000	.0999	KV	12-31	1200	76	45
100.0003	10.0001	.9999	.0998	KV	1-1	1345	75	44
100.0004	10.0001	.9997	.0999	Clp	1-2	1230	77	48
100.0003	10.0000	1.0001	.0999	Clp	1-4	1430	74	44
100.0003	9.9999	1.0000	.0999	Clp	1-5	1206	74	47
100.0002	9.9999	1.0000	.0999	Clp	1-6	1000	77	49
100.0000	10.0001	.9999	.0997	KV	1-8	1000	71	41
100.0002	10.0000	1.0000	.0999	Clp	1-9	1400	75	48
100.0000	10.0001	1.0000	.0999	Clp	1-12	1200	74	47
100.0001	10.0001	.9999	.0998	Clp	1-13	1500	73	49
99.9999	10.0003	.9998	.0998	Clp	1-15	1230	69	49
100.0003	10.0001	1.0001	.1000	Clp	1-16	1415	70	48
100.0003	10.0001	.9998	.0996	KV	1-24	1015	67	46
100.0003	10.0001	1.0000	.1000	KV	1-25	920	70	44
100.0001	10.0000	1.0000	.0999	Clp	2-2	530	74	48
100.0003	10.0002	.9999	.0998	KV	2-2	0930	75	48
100.0004	10.0002	.9999	.0999	KV	2-3	0900	74	47
100.0001	10.0002	1.0000	.1000	Clp	2-4	1100	77	42
100.0002	10.0000	1.0000	.1000	KV	2-6	1202	74	44
100.0000	10.0001	1.0000	.1000	KV	2-7	1119	73	43
99.9999	10.0001	1.0001	.0999	Clp	2-8	1135	75	41
100.0002	10.0001	.9999	.0999	KV	2-10	0930	72	42
100.0000	10.0000	.9999	.0999	Clp	2-13	0940	75	46
100.0001	10.0002	1.0000	.0999	KV	2-20	1200	71	44
100.0003	10.0001	.9999	.0999	Clp	3-1	1215	78	43
100.0004	10.0001	1.0000	.0999	Clp	3-2	1515	74	49
100.0001	10.0003	1.0001	.1001	KV	3-3	1100	74	44
100.0004	10.0002	1.0000	.0998	Clp	3-6	1300	75	48
100.0002	10.0001	1.0002	.0999	Clp	3-7	1905	75	48
100.0002	9.9999	.9999	.0999	Clp	5-24	1600	78	46
100.0004	10.0001	.9999	.0999	Clp	5-25	0830	76	45
100.0000	9.9999	.9997	.0999	Clp	5-26	0840	74	47
100.0003	9.9999	1.0000	.0998	Clp	5-30	1220	73	48
100.0002	10.0001	.9999	.1000	Clp	5-31	1015	78	46

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 10-21-2005 Through 12-6-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	1.0000	.0999	Clp	10-21	0900	74	44
100.0000	10.0001	1.0000	.0999	Clp	10-22	1630	78	46
99.9998	10.0000	.9998	.0998	Clp	10-23	1130	74	49
99.9996	10.0000	.9998	.0997	KV	10-24	9:00	77	52
100.0000	10.0003	1.0000	.0999	KV	10-25	9:30	76	49
99.9999	10.0001	.9999	.0997	KV	10-26	9:50	70	48
99.9998	10.0000	.9999	.0998	KV	10-27	8:25	75	47
99.9996	10.0003	1.0001	.0999	KV	10-28	10:45	68	47
99.9999	10.0001	1.0000	.1000	Clp	10-29	1900	75	44
99.9998	10.0003	1.0000	.0999	Clp	10-30	1145	72	42
99.9999	10.0000	0.9998	.0998	KV	10-31	9:00	78	44
100.0001	10.0000	0.9997	.1000	KV	11-1	0850	75	42
99.9996	9.9998	.9998	.0996	KV	11-2	0915	72	49
99.9996	10.0000	1.0000	.0998	KV	11-3	1429	73	46
99.9997	10.0000	.9999	.0999	KV	11-4	1100	72	42
100.0002	10.0000	1.0001	.1000	Clp	11-5	1015	69	44
99.9998	10.0001	1.0000	.0999	KV	11-7	0930	75	41
99.9998	10.0000	.9998	.0999	KV	11-9	1111	70	48
100.0002	10.0001	.9999	.1000	KV	11-10	1040	73	47
99.9999	10.0001	.9999	.0998	Clp	11-12	1600	67	49
100.0001	10.0000	1.0000	.0999	Clp	11-13	1430	74	47
99.9999	10.0000	1.0000	.0999	Clp	11-15	1500	72	44
100.0002	10.0000	.9999	.0999	KV	11-16	0815	70	44
100.0005	10.0000	1.0000	.0999	Clp	11-17	0930	72	46
100.0004	10.0002	1.0001	.1000	Clp	11-18	1600	72	48
100.0003	10.0001	.9999	.0999	Clp	11-20	1100	68	47
100.0004	10.0002	1.0000	.1000	Clp	11-21	1200	74	44
100.0002	10.0002	.9999	.0998	Clp	11-22	1030	74	42
99.9999	10.0000	1.0000	.0999	Clp	11-25	1000	69	47
100.0002	10.0001	.9999	.0999	KV	11-26	1330	72	47
100.0000	10.0001	.9999	.0999	KV	11-27	1145	73	43
100.0001	10.0002	1.0000	.1000	Clp	11-28	1000	72	42
100.0004	10.0000	1.0000	.0998	Clp	11-29	0940	72	42
99.9999	10.0001	1.0001	.0999	KV	11-30	0930	70	44
100.0001	10.0001	1.0000	.0998	Clp	12-1	0900	70	41
100.0000	10.0000	.9999	.1000	Clp	12-2	1340	72	42
100.0000	10.0000	.9998	.0999	Clp	12-3	1400	68	43
99.9999	9.9998	.9999	.0996	Clp	12-5	1620	71	45
99.9997	10.0001	1.0000	.0994	Clp	12-6	1430	69	44

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 07/15/05 Through 10-20-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9998	9.9994	.9999	.0998	[illegible]	07/15	2000	78	46
99.9997	9.9998	1.0000	.1000	[illegible]	07/19	2250	78	46
100.0000	9.9994	.9999	.0999	[illegible]	07/20	0740	78	46
100.0000	9.9999	1.0000	.1000	[illegible]	07/21	2100	78	46
99.9998	9.9998	.9999	.1000	[illegible]	07/24	2200	78	46
100.0001	10.0000	1.0000	.1000	[illegible]	07/27	1515	78	49
99.9998	10.0000	.9998	.1000	[illegible]	07/28	0600	78	49
99.9999	10.0001	1.0000	.1000	[illegible]	07/29	1210	78	49
100.0000	10.0000	1.0001	.0998	CW	9-6	0930	74	48
100.0000	9.9998	.9998	.0996	CW	9-7	0955	72	47
99.9999	10.0000	1.0001	.1000	CW	9-8	1010	78	43
99.9999	10.0001	.9999	.0999	CW	9-9	0945	75	48
99.9996	9.9999	1.0000	.1000	CW	9-10	1630	75	48
99.9998	9.9999	1.0000	.0999	CW	9-11	1300	75	44
99.9997	10.0000	1.0000	.0998	CW	9-12	0920	74	48
99.9998	10.0001	.9999	.0999	CW	9-13	0945	74	47
99.9996	10.0001	.9999	.0999	CW	9-14	1400	77	46
99.9997	10.0001	1.0001	.0999	CW	9-15	0815	75	48
99.9996	10.0000	1.0000	.1000	CW	9-16	0955	76	49
99.9998	10.0001	.9999	.0998	CW	9-17	1200	76	45
99.9997	9.9998	.9999	.0998	CW	9-18	1430	73	47
100.0004	10.0002	1.0000	.0998	CW	9-19	0810	74	44
100.0000	10.0000	1.0000	.1000	CW	9-20	1810	77	44
100.0000	10.0000	1.0000	.0998	CW	9-21	1620	78	46
100.0000	10.0001	1.0000	.0999	CP	9-22	1420	76	49
100.0004	10.0003	1.0000	.0997	CP	9-23	1300	72	46
99.9998	10.0001	1.0000	.0999	CP	10-1	1830	74	47
100.0000	10.0000	1.0000	.0999	CP	10-2	1830	69	47
100.0001	10.0001	.9998	.0999	CP	10-5	0840	74	47
99.9998	10.0001	1.0000	.0999	CP	10-6	0930	77	47
99.9998	10.0002	.9999	.1000	CP	10-8	1340	75	45
100.0000	10.0002	.9999	.0997	CP	10-10	1330	76	48
99.9999	10.0000	1.0001	.1000	CP	10-11	1020	77	46
99.9998	10.0002	.9999	.1000	CP	10-12	1000	74	44
100.0001	10.0001	1.0000	.0997	CP	10-13	1020	70	48
99.9999	10.0000	1.0001	.0999	CP	10-14	1000	70	48
100.0000	10.0001	.9999	.0999	CP	10-15	1440	72	46
99.9997	9.9999	1.0000	.1000	CP	10-20	1000	77	49

BLANK PROCESSING DATA SHEET # 5

UNIT : Jotul C350 RUN : 1 DATE : 7-28-06

BLANKS DONE : 10-11-2005

BEAKER	A	B	C
	200 ml ACETONE	75 ml DICHLOR	200 ml WATER
	FISHER OPTIMA LOT # 023283	FISHER OPTIMA LOT # 035941	DWNA, Inc. Sparklettes Distilled
FINAL WEIGHT	108.9008	106.3077	106.9670
TARE WEIGHT	108.8995	106.3066	106.9645
NET WEIGHT	.0013	.0011	.0025

TARE BEAKERS INTO DESC : TIME : 1900 DATE : 10-2-2005

DATE : 10-5 BY : CP DATE : 10-6 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.8996	0912	108.8995	1001	✓	
B	106.3065	0913	106.3066	1002	✓	
C	106.9642	0914	106.9645	1003	✓	

FINAL BEAKERS INTO DESC : TIME : 1000 DATE : 10-8-05

DATE : 10-10 BY : CP DATE : 10-11 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.9010	1348	108.9008	1105	✓	
B	106.3076	1349	106.3077	1106	✓	
C	106.9675	1350	106.9670	1109	✓	

TARE QC

DATE	TIME	BY	WB	DB	%
10-5	0840	CP	5	74	44
10-6	0930	CP		77	47

FINAL QC

DATE	TIME	BY	WB	DB	%
10-10	1330	CP	5	76	48
10-11	1020	CP		77	46

NET PARTICULATE CATCH CALCULATION DATA SHEET #6

UNIT: Total C350 RUN: 1 DATE: 7-28-06

Blank Audit by C Charlington 10-14-2005

BLANK CALCULATIONS

Acetone :	.0013	g ÷	200	ml =	.000007	g/ml
Dicholoromethane :	.0011	g ÷	75	ml =	.000015	g/ml
Distilled Water :	.0025	g ÷	200	ml =	.000013	g/ml

FRONT HALF CATCH

FILTERS : .2029 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .2029 g

BEAKERS : .0542 (Total Catch) g - 75 (ml Acetone) (.0005 .000007 g) (Blank Value / ml Acetone) = .0537 g

TOTAL FRONT HALF CATCH : .2566 g

BACK HALF CATCH

FILTERS : .0374 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .0374 g

BEAKERS :

Acetone : .0953 (Total Catch) g - 150 (ml Acetone) (.0011 .000007 g) (Blank Value / ml Acetone) = .0942 g

Extract : .0199 (Total Catch) g - 75 (ml Dichloromethane) (.0011 .000015 g) (Blank Value / Dichloromethane) = .0188 g

Water : .0640 (Total Catch) g - 240 (ml Water) (.0031 .000013 g) (Blank Value / Water) = .0609 g

TOTAL BACK HALF CATCH : .2113 g

TOTAL CATCH : .4679 g

% FRONT HALF : 54.8 %

CALCULATIONS DATA SHEET # 7

UNIT : Jotul C350 RUN : 1 DATE : 7-28-06

1) $Vm(std) = \dfrac{(66.778\ Vm)(17.64)(.981\ mcf)\left(30.04\ "Hg + \frac{.172\ "H_2O}{13.6}\right)}{(547\ TmA)} = \dfrac{63.4887}{000.0000}$ dscf

2) $Vw(std) = (.04707)(63.6\ ml\ H_2O) = \dfrac{2.9937}{00.0000}$ scf

3) $Asw = \dfrac{(2.9937\ scf)}{(2.9937\ scf + 63.4887\ dscf)} = \dfrac{.0450}{.0000}$ Bws × 100 = $\dfrac{4.5030}{00.0000}$ % H_2O

4) $Cs = \dfrac{(.4679\ g.)}{(63.4887\ dscf)}(15.43) = \dfrac{.1137}{0.0000}$ gr / dscf

5) Estimated g / hr = $\dfrac{(.4679\ g.)}{(63.4887\ dscf)}\left(\dfrac{6.992}{00.0000}\ dscfm\right)(60) = \dfrac{3.0918}{00.0000}$ g / hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf =	meter correction factor (Y factor) of meter box used for test	(p. 2)	(0.000 mcf)
" Hg =	average barometric pressure during test	(p. 2)	(00.00 " Hg)
" H_2O =	average delta H for test	(p. 2)	(.000 " H_2O)
TmA =	average meter temperature for test in degrees Absolute	(p. 2)	(000 TmA)
ml H_2O =	total water caught during test	(p. 3)	(000.0 ml H_2O)
g. =	total particulate catch for test	(p. 6)	(00.0000 g.)
dscfm =	average stack flow during test	(p. 2)	(00.000 dscf)

TEST DATA SHEET # 8

UNIT : Jotul C350 RUN : 1 DATE : 7-28-06

Test Chamber Air Velocity Start : Ø Stop : Ø Avg.: Ø

Wet Bulb / Dry Bulb

Pre : WB : 64 DB : 84 = 32 % RH 1.3 % H_2O

Post : WB : 64 DB : 82 = 36 % RH 1.4 % H_2O

Average : 34 % RH 1.35 % H_2O

Empty Stove Weight (lbs) : — w/ stack & oil seal : Wet : — Dry : 352.2

Kindling Weight (lbs) : Paper : .1 Wood : 3.3

Preburn Fuel Weight : 12.5 + 9.5 + 7.5 Total : 29.5

Kindling & Preburn Fuel Weight (wood only) (lbs) : **Total :** 32.8

Coal Bed Wt Range (lbs) : 2.1 - 1.7 **Scale :** 354.3 - 353.9

Upper : .25 x fuel weight : Always round DOWN to nearest tenth

Lower : .20 x fuel weight : Always round UP to nearest tenth **Actual Coal Bed Weight :** 2.0

Maximum Coal Bed Removal (lbs) : ((2.1 (Upper) + 1.7 (Lower)) ÷ 2) .25 = .4 (round down to nearest tenth)

Test Fuel (.75" x 1.5" x 5" spacers) = 16 pcs

Dimensions	Length in inches	No. Pcs	Weight in lbs	% of Load
2" x 4"	17.0	4	8.4	100.0
4" x 4"	—	—	—	

Test Fuel Weight : 8.4 lbs

Estimated Dry Burn Rate :

$$\frac{8.4 - (8.4 \times .17110)}{2.2046} \times \frac{60}{\frac{200}{\text{TIME}}} = .948 \text{ kg / hr}$$

Estimated BTU's/hr : 19,140 x $\frac{63}{100}$ x $\frac{.948}{\text{DBR}}$ = 11431.2 BTU's/hr

EPA Default Efficiencies : Non-cat : 63 Cat : 72 Pellet : 78

190 = .99

WOOD STOVE OPERATING DATA PAGE #9

Unit : Jotul C350 Run : 1 Date : 7-28-06

FIRE STARTED: 0910

WARM UP AND PREBURN:

PRIMARY AIR : Set wide open for all warm-up / preburn fuel charges. Then set to 1/8" at start of preburn.

SECONDARY AIR : N/A CAT BYPASS : N/A

CHARCOAL BED PREPARATION :

Raked and leveled prior to each warm-up / preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 25 sec.

TEST:

DOOR wide open during loading Ø min. 50 sec.

PRIMARY AIR : Opened full for first 5 min., then set to run setting of 1/8'.

SECONDARY AIR : N/A CAT BYPASS : N/A

FAN:

ON / OFF during warm-up

ON / OFF first 30 minutes of test

Fan speed set at LOW

ON / OFF during preburn

ON / OFF balance of test run

WOOD DATA: KINDLING: A mix of the grades listed below:

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2x4	Manke/Tacoma	Std. or better	s. grn D fir
TEST:	2x4	Packwood	# 2 or better	s. grn D fir
	4x4	Packwood	# 2 or better	s. grn D fir

PELLET FUEL MANUFACTURER : N/A BRAND : N/A

All Grades WCLB rules:

WARM UP INFORMATION:

All pre-burn / warm up fuel pieces were either 10 or 16 inches.

1st warm up / pre-burn fuel charge (12.5 lbs.) added at 0928

2nd warm up / pre-burn fuel charge (9.5 lbs.) added at 1033

3rd warm up / pre-burn fuel charge (7.5 lbs.) added at 1120

4th warm up / pre-burn fuel charge (lbs.) added at

5th warm up / pre-burn fuel charge (lbs.) added at

TEST DATA SHEET #10

Unit : Jotul C350 Run : 1 Date : 7-28-06

Room Temperature : 69 °F Correction Factor : Ø

Uncorrected Values are corrected for room temperature : Yes _____ No ✓

Time Test Fuel moisture reading taken : 1105

Calibration Checks : X ✓ Y ✓ 12.0 12.1 22.0 22.1

pc #	Dimen.	Use	TOP		BOTTOM		SIDE		Average Corrected
			Uncor.	Cor.	Uncor.	Cor.	Uncor.	Cor.	
1	2"×4"×8'	K	12.5	13.3	13.0	13.8	13.0	13.8	13.633
2									
3									
4	2"×4"×8'	P	18.5	19.8	19.0	20.3	19.0	20.3	20.133
5	2"×4"×8'	P	18.5	19.8	18.5	19.8	18.0	19.2	19.600
6	2"×4"×8'	P	21.0	22.5	20.5	22.0	20.5	22.0	22.167
7	2"×4"×8'	P	21.0	22.5	21.0	22.5	21.0	22.5	22.500
8	2"×4"×8'	P							84.400
9									
10									
11	2x4x17	T	19.0	20.3	19.5	20.9	19.5	20.9	20.700
12	"	T	18.0	19.2	18.0	19.2	17.5	18.7	19.033
13	"	T	19.0	20.3	19.0	20.3	19.0	20.3	20.300
14	"	T	20.5	22.0	21.0	22.5	22.0	23.1	22.533
15									82.566
16									
17									
18									
19									
20	Spacers	T	21.5	23.1	21.5	23.1	21.5	23.1	23.100

Key for Use : K = Kindling P = Pretest Fuel T = Test Fuel

	KINDLING	PRETEST FUEL	TEST FUEL
Dry Moisture % :	13.633 %	21.100 %	20.642 %
Wet Moisture % :	11.997 %	17.424 %	17.110 %

To obtain Wet from Dry : $\frac{100 \times \%\text{ Dry Reading}}{100 + \%\text{Dry Reading}}$ = % Moisture, Wet Basis

Acceptable Ranges : 16 - 20 % wet: 19 - 25 % dry (17.5 - 22.5 on Meter Uncor. reading) at 70°

GAS DATA SHEET #12

WEIGHT: 354.2 DATE: 7-28-06

UNIT: Total C350 RUN: 1 PAGE: 1 OF 2

TIME	SCALE	FUEL	DROP	V.	CO_2	V.	O_2	V.	CO	STATIC	SO_2PPM
0 1333	362.6	8.4	—	.212	5.3	.595	14.8	.067	.66	-.029	525
5 40	362.1	7.9	.5	.139	3.5	.681	17.0	.031	.30	-.048	425
10 45	361.9	7.7	.2	.110	2.8	.705	17.6	.047	.46	-.032	525
15 50	361.7	7.5	.2	.137	3.4	.683	17.0	.037	.36	-.033	525
20 55	361.5	7.3	.2	.124	3.1	.692	17.3	.044	.43	-.032	525
25 1400	361.2	7.0	.3	.128	3.2	.685	17.1	.052	.51	-.031	525
Fan? 30 05	360.8	6.6	.4	.241	6.0	.566	14.1	.065	.64	-.037	525
35 10	360.4	6.2	.4	.212	5.3	.601	15.0	.053	.52	-.039	500
40 15	359.9	5.7	.5	.305	7.6	.507	12.6	.054	.53	-.043	475
45 20	359.6	5.4	.3	.267	6.7	.546	13.6	.050	.49	-.043	500
50 25	359.0	4.8	.6	.312	7.8	.507	12.6	.037	.36	-.046	450
53 30	358.6	4.4	.4	.380	9.5	.441	11.0	.030	.29	-.048	450
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.461	*****
60 1435	358.1	3.9	.5	.373	9.3	.451	11.3	.023	.22	-.049	425
65 40	357.6	3.4	.5	.390	9.8	.433	10.8	.025	.24	-.049	450
70 45	357.2	3.0	.4	.366	9.2	.457	11.4	.026	.25	-.048	450
75 50	356.8	2.6	.4	.365	9.1	.463	11.5	.017	.16	-.048	450
80 55	356.5	2.3	.3	.343	8.6	.484	12.1	.015	.14	-.046	450
85 1500	356.2	2.0	.3	.307	7.7	.517	12.9	.024	.23	-.046	450
90 05	356.0	1.8	.2	.343	8.6	.475	11.8	.037	.36	-.048	450
95 10	355.7	1.5	.3	.273	6.8	.541	13.5	.048	.47	-.046	475
100 15	355.6	1.4	.1	.211	5.3	.593	14.8	.071	.70	-.043	525
105 20	355.5	1.3	.1	.202	5.1	.597	14.9	.085	.84	-.041	500
110 25	355.3	1.1	.2	.198	5.0	.599	14.9	.092	.91	-.038	500
115 30	355.3	1.1	0	.198	5.0	.600	15.0	.085	.84	-.036	500
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.538	*****
120 1535	355.2	1.0	.1	.189	4.7	.605	15.1	.098	.97	-.036	500
125 40	355.1	.9	.1	.180	4.5	.611	15.2	.108	1.07	-.035	500
130 45	355.1	.9	0	.165	4.1	.630	15.7	.100	.99	-.035	500
135 50	355.0	.8	.1	.153	3.8	.634	15.8	.119	1.18	-.034	475
140 55	354.9	.7	.1	.147	3.7	.635	15.9	.128	1.27	-.033	475
145 1600	354.9	.7	0	.145	3.6	.635	15.8	.134	1.33	-.033	475
150 05	354.8	.6	.1	.142	3.6	.643	16.0	.122	1.21	-.032	500
155 10	354.7	.5	.1	.144	3.4	.640	16.0	.124	1.23	-.031	500
160 15	354.7	.5	0	.144	3.6	.642	16.0	.120	1.19	-.031	500
165 20	354.6	.4	.1	.139	3.5	.649	16.2	.113	1.12	-.031	500
170 25	354.6	.4	0	.133	3.3	.657	16.4	.111	1.10	-.030	525
175 30	354.5	.3	.1	.130	3.3	.660	16.5	.108	1.07	-.029	525
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.390	*****
TOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1.389	*****

GAS DATA SHEET #12

WEIGHT: 354.2 DATE: 7-28-06

UNIT: Jotul C350 RUN: 1 PAGE: 2 OF 2

TIME	SCALE	FUEL	DROP	V.	CO_2	V.	O_2	V.	CO	STATIC	SO_2PPM
180 1635	354.5	.3	ϕ	.132	3.3	.658	16.4	.109	1.08	-.029	525
185 40	354.4	.2	.1	.131	3.3	.661	16.5	.101	1.00	-.028	525
190 45	354.3	.1	.1	.127	3.2	.667	16.6	.100	.99	-.028	525
195 50	354.3	.1	ϕ	.124	3.1	.669	16.7	.101	1.00	-.029	525
200 55	354.2	ϕ	.1	.123	3.1	.668	16.7	.104	1.03	-.028	525
										-.142	
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****		*****
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****		*****
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****		*****
TOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1,531	*****

-.037

-.41

PREBURN DATA SHEET #13

UNIT: Jotul C350 RUN: 1 DATE: 7-28-06 PAGE: 1 of

TIME	SCALE	DROP	STACK	TOP	LF SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC/CAT	AMBIENT	STATIC	COMMENTS
0 / 1225	354.8	—	389	663	365	511	484	713	1055	1065	81	-.056	PREBURN START: # .5 UP
5 / 30	354.7	.1	254	597	358	452	471	673	1013	885	84	-.044	COAL BED SCALE RANGE:
10 / 35	354.7	ϕ	235	562	349	436	459	633	980	851	84	-.041	354.3 → 353.9
15 / 40	354.6	.1	222	530	335	408	440	591	911	816	84	-.039	PRIMARY AIR: 1/8"
20 / 45	354.6	ϕ	214	501	322	388	424	562	878	783	84	-.039	SECONDARY AIR: N/A
25 / 50	354.5	.1	208	481	310	372	412	545	842	763	82	-.038	FAN: LOW
30 / 55	354.5	ϕ	205	458	304	359	400	518	814	738	83	-.036	PUMPS ON AT:
35 / 1300	354.4	.1	202	441	296	346	389	500	777	716	83	-.034	CHECK WB/DB:
40 / 05	354.4	ϕ	196	419	287	330	374	481	749	675	82	-.034	
45 / 10	354.3	.1	192	404	280	319	365	466	688	654	82	-.032	367
50 / 15	354.3	ϕ	185	386	265	306	350	448	643	631	80	-.031	351
55 / 20	354.3	ϕ	179	373	264	297	343.	435	619	607	86	-.030	342.4
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	
60 / 1325	354.3	ϕ	175	359	255	288	333	426	591	587	79	-.030	
65 / 30	354.2	.1	179	346	248	279	325	416	567	572	78	-.030	323
70 / 35	354.2	ϕ	178	331	243	270	315	403	577	536	79	-.029	312.2

Jotul C350

Temperature Data Sheet #14

Run 1
7/28/2006

Time	Stack	Top	LT Side	Back	Rt Side	Bottom	Firebox	Sec/Cat	Ambient	Tube Furn	Smpl Box	Smpl Out	C-Gas Box	C-Gas Out	SO2 Out
********	Chn 103	Chn 104	Chn 105	Chn 106	Chn 107	Chn 108	Chn 109	Chn 110	Chn 111	Chn 112	Chn 113	Chn 114	Chn 115	Chn 116	Chn 117
0	178	331	243	270	315	403	577	536	79	1630	242	55	228	37	35
5	293	321	237	293	306	399	698	538	78	1587	240	39	228	37	35
10	190	317	233	286	298	391	645	438	79	1549	240	39	229	37	35
15	179	309	227	276	288	387	604	441	79	1519	239	39	229	37	35
20	173	302	219	267	277	380	588	451	78	1495	238	39	229	37	35
25	169	295	210	260	268	373	575	459	77	1474	236	40	230	37	35
30	197	328	206	253	262	365	563	701	77	1457	236	40	230	37	35
35	202	350	202	238	259	357	530	736	77	1442	235	40	230	37	36
40	229	392	197	221	259	349	498	791	77	1430	235	40	231	38	36
45	236	415	197	227	262	337	473	893	77	1420	234	40	231	38	36
50	252	442	201	236	269	328	461	1009	77	1412	234	40	231	38	36
55	273	484	206	240	275	319	455	1135	78	1405	234	40	231	38	36
60	279	519	211	246	284	313	454	1031	77	1400	234	40	230	38	37
65	281	541	226	261	294	308	459	1047	78	1396	235	40	230	38	37
70	278	553	233	276	303	304	468	992	79	1393	236	40	232	38	37
75	276	562	241	291	311	301	478	1022	80	1391	237	41	233	38	37
80	272	568	252	305	319	303	491	1029	81	1389	237	41	234	38	37
85	269	566	257	314	324	301	507	914	80	1389	238	41	235	38	37
90	273	558	260	319	326	300	543	876	81	1389	238	41	236	38	37
95	267	553	271	330	328	300	581	847	81	1390	239	42	237	37	37
100	245	532	274	333	330	302	618	812	81	1391	239	42	237	37	37
105	230	501	270	326	331	306	629	783	81	1392	239	42	237	37	37
110	220	479	272	320	333	309	628	766	82	1393	240	42	238	37	37
115	211	457	271	313	332	312	617	778	82	1394	240	42	238	37	37
120	206	440	267	306	331	317	609	763	81	1394	240	43	238	37	37
125	202	425	263	301	330	320	607	734	82	1394	241	43	238	37	37
130	199	412	257	296	327	322	629	704	81	1394	240	43	237	37	36
135	195	397	257	289	324	323	650	684	82	1394	240	43	237	36	36
140	192	384	254	282	320	324	655	664	81	1394	240	44	237	36	36
145	188	371	251	276	315	325	653	650	81	1394	240	44	236	36	36
150	185	361	247	271	311	323	644	633	81	1393	239	44	236	36	36
155	182	348	244	267	307	321	617	616	81	1393	239	44	235	36	36
160	180	341	240	264	302	319	581	604	81	1393	238	44	235	36	36
165	177	333	239	260	297	316	569	592	80	1393	237	44	235	36	36
170	175	326	240	259	294	312	550	582	80	1393	237	44	234	36	36

175	174	319	238	257	290	310	529	569	81	1393	238	44	234	36	36
180	172	312	233	256	285	307	499	545	81	1392	237	45	234	36	36
185	171	307	232	254	280	303	476	532	81	1392	237	45	234	36	35
190	169	301	229	253	275	300	460	522	81	1391	237	45	234	36	35
195	167	296	226	250	270	296	447	512	80	1391	237	45	233	36	35
200	166	291	227	248	266	291	437	503	80	1391	236	47	233	36	35

TEMPERATURE DATA SHEET #14A

		TEST TIME	200		
STACK AVG	214	TOP AVG	406	LT SIDE AVG	238
BACK AVG	275	RT SIDE AVG	299	BOTTOM AVG	326
FIREBOX AVG	555	SEC/CAT AVG	718	AMBIENT AVG	80

END	264.7	
START	312.2	
	-47.5	DELTA T

CIRCLE: LOSS / GAIN

ZERO / SPAN CHECK DATA SHEET #15-1

Date : 7-28-06 Analyte : CO_2 (15-1)

Unit : Jotul C350 Run # : 1

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % CO_2 Cyl. Press. : 975 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 407069

Range : 0 - 25.0 % CO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % CO_2

EPA Control Limits = ± 2.5% of 25.0 % CO_2 = ± 0.625 % CO_2

Method 28 A = ± .2 % of 25.0 % CO_2 = ± .05 % CO_2

PRE RUN Audit : by : C Watkins Time : 1130 Temp : 83 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	.012	.012	.049
SPAN	50.0	.500	12.50	50.0	.500	12.497	-.003	-.012

POST RUN Audit : by : C Watkins Time : 1720 Temp : 81 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	.037	.037	.149
SPAN	50.0	.500	12.50	49.8	.498	12.447	-.053	-.212

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-2

Date : 7-28-06 Analyte : O_2 (15-2)

Unit : Sotul C350 Run # : 1

Zero Cyl. # : 168TAC 3A Conc. : 0.00 % O_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % O_2 Cyl. Press. : 975 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : TELEDYNE Model : 320 A SN : 37400

Range : 0 - 25.0 % O_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % O_2

EPA Control Limits = ± 2.5% of 25.0 % O_2 = ± 0.625 % O_2

Method 28 A = ± .2 % of 25.0 % O_2 = ± .05 % O_2

PRE RUN Audit : by : C. Wadsworth Time : 1130 Temp : 83 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	-.010	-.010	-.039
SPAN	12.50	.500	12.50	12.5	.500	12.471	-.029	-.115

POST RUN Audit : by : C. Wadsworth Time : 1720 Temp : 81 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.002	.040	.040	.161
SPAN	12.50	.500	12.50	12.5	.501	12.496	-.004	-.016

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-3

Date : 7-28-06 Analyte : CO (15-3)

Unit : Jotul C350 Run # : 1

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 4.99 % CO Cyl. Press. : 975 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 408005

Range : 0 - 10.0 % CO Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 10.0 % CO

EPA Control Limits = ± 2.5% of 10.0 % CO = ± 0. 25 % CO

Method 28 A = ± .2 % of 10.0 % CO = ± .02 % CO

PRE RUN Audit : by : C. Wadsworth Time : 1130 Temp : 83 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	-.016	-.016	-.159
SPAN	49.9	.499	4.99	49.9	.499	5.001	.011	.109

POST RUN Audit : by : C. Wadsworth Time : 1720 Temp : 81 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	-.016	-.016	-.159
SPAN	49.9	.499	4.99	50.0	.500	5.011	.021	.210

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-4

Date : 7-28-06 Analyte : SO_2 (15-4)

Unit : Total C350 Run # : 1

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 ppm SO_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC62184 Conc. : 1290 ppm SO_2 Cyl. Press. : 400 PSI

Certified by : AIR LIQUIDE Date : 01-29-01

Analyzer : Make : HORIBA Model : PIR-2000 SN : 403019

Range : 0 - 2500 ppm SO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 2500 ppm SO_2

EPA Control Limits = ± 2.5% of 2500 ppm SO_2 = ± 62.5 ppm SO_2

PRE RUN Audit : by : C. Wadsworth Time : 1130 Temp : 83 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	8,235	8,235	.329
SPAN	51.6	.516	1290	51.6	.516	1289.4	-.600	-.024

POST RUN Audit : by : C. Wadsworth Time : 1720 Temp : 81 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.3	.003	15.683	15.683	.627
SPAN	51.6	.516	1290	51.5	.515	1286.9	-3.100	.124

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

QUALITY CHECKS DATA SHEET # 16

UNIT : Total C350 RUN : 1 DATE : 7-28-06

Thermocouple Check:

T/C # 1	— °F	T/C # 13	70.5 °F
T/C # 2	— °F	T/C # 14	69.9 °F
T/C # 3	68.0 °F	T/C # 15	71.4 °F
T/C # 4	68.5 °F	T/C # 16	69.9 °F
T/C # 5	67.0 °F	T/C # 17	72.9 °F
T/C # 6	68.8 °F	T/C # 18	70.0 °F
T/C # 7	68.1 °F	T/C # 19	68.0 °F
T/C # 8	68.2 °F	T/C # 20	— °F
T/C # 9	66.7 °F	T/C # 21	— °F
T/C # 10	65.2 °F	T/C # 22	— °F
T/C # 11	64.3 °F	T/C # 23	— °F
T/C # 12	75.6 °F	T/C # 24	— °F

Thermocouple Readout:

Pretest zero and span check and calibration — post test zero and span — % difference

ZERO .5 °F Adj. to 0.0 °F ZERO 0.0 °F Difference .025 %

SPAN 1998.3 °F Adj. to 2000.0 °F SPAN 2000.2 °F Difference .010 %

Thermocouple Readout Pretest Linearity Check:

0	= 0.0 °F	200	= 200.3 °F	400	= 400.0 °F
600	= 599.9 °F	800	= 799.7 °F	1000	= 999.8 °F
1200	= 1199.7 °F	1400	= 1399.5 °F	1600	= 1599.5 °F
1800	= 1799.6 °F	2000	= 2000.0 °F		

Sample Train Leak Check	Pre ✓	Post ✓
C-gas Train Leak Check	Pre ✓	Post ✓
SO_2 Train Leak Check	Pre ✓	Post X
Static Gauge Zero Check	Pre ✓	Post X

Scale Check Pre : 364.5 − 354.5 = 10.0

Post : 364.2 − 354.2 = 10.0

Stack Cleaned Prior to Test Run : YES X NO —

TABLE 1 ----- RAW DATA

CLIENT : Jotul TEST No. : 2

MODEL: C350 DATE: 29-Jul-06

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	584.000	0.150	74	0.62	3.10	400
5	585.500	0.380	76	0.72	4.20	250
10	587.930	0.200	77	0.39	3.30	350
15	589.674	0.190	78	0.36	3.40	350
20	591.425	0.170	78	0.49	6.40	375
25	593.059	0.190	78	0.38	5.30	350
30	594.809	0.220	79	0.40	6.50	325
35	596.701	0.220	79	0.45	7.60	325
40	598.593	0.220	79	0.40	8.80	325
45	600.485	0.220	79	0.36	8.80	325
50	602.377	0.220	80	0.28	9.90	325
55	604.276	0.220	80	0.18	8.50	325
60	606.175	0.220	80	0.21	8.50	325
65	608.074	0.220	80	0.38	9.40	325
70	609.973	0.190	80	0.29	8.80	350
75	611.736	0.190	80	0.12	8.60	350
80	613.500	0.190	80	0.14	7.80	350
85	615.263	0.190	80	0.25	7.10	350
90	617.027	0.190	80	0.29	6.70	350
95	618.790	0.170	80	0.39	6.40	375
100	620.437	0.150	80	0.67	5.30	400
105	621.980	0.150	80	0.68	5.00	400
110	623.523	0.150	80	0.76	4.90	400
115	625.067	0.150	80	0.81	4.90	400
120	626.612	0.150	80	0.96	4.70	400
125	628.157	0.150	80	1.09	4.60	400
130	629.702	0.150	80	0.88	4.70	400
135	631.247	0.150	80	1.33	4.30	400
140	632.792	0.150	80	1.24	4.20	400
145	634.337	0.150	80	1.36	4.20	400
150	635.882	0.150	80	1.31	4.10	400
155	637.427	0.150	80	1.08	4.10	400
160	638.972	0.150	80	0.95	4.30	400
165	640.516	0.150	80	1.03	4.10	400
170	642.061	0.150	80	1.09	3.90	400
175	643.606	0.150	80	1.01	3.70	400

TABLE 2---RAW DATA

CLIENT : Jotul TEST No. 2

MODEL: C350 DATE: 29-Jul-06

METER CAL. FACTOR (Y)	-------	0.981	Wt. WOOD BURNED(LB)	-------	8.8 Lbs
BAROMETRIC PRESS.(Pb)	-------	30.07 in Hg	WET,FUEL MOISTURE %	-------	17.372 %
LEAK RATE POST (Lp)	-------	0.009 cfm	Wt. PART. COLLECTED	-------	0.4701 g
WATER VOL. (V1c)	-------	67.3 Ml	METER VOLUME Vm	-------	59.606 mcf
TEST TIME (MIN)	-------	175 min	HC MOLE FRACTION	-------	0.0132

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : Jotul TEST No. 2

MODEL: C350 DATE: 29-Jul-06

****

AVG DELTA H	-------	0.18	in H2O	AVG PRCNT CO	-------	0.65	%
AVG METER TEMP. Tm	-------	79	deg F	AVG PRCNT CO2	-------	5.84	%
AVG PPM SO2	-------	367	PPM	AVG BAL CO2/CO	-------	9.00	%

TABLE 4 ----- CALCULATIONS

CLIENT : Jotul TEST No. 2

MODEL: C350 DATE: 29-Jul-06

STD SAMPLE VOL. Vm(std) d) ------	57.56	dscf	STACK GAS FLOW Qsd -------	521.989	dscf/Hr &
				8.70	dscf/min
VOL. WATER VAPOR Vw(s td) -----	3.168	scf	PARTICULATE CONCTRT. C s ------	0.0082	g/dscf
PRCNT MSTR Bws -------	5.22	%	PARTC.EMISS. RATE E -------	4.26	g/Hr
BURN RATE BR -------	1.13	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.54	Lb-mole/Lb
CO EMISSION RATE -------	113.38	g/Hr &	PART.EMISS. RATE ------	3.77	g/Kgdry fuel
	100.25	g/Kgdry fuel			

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : Jotul TEST No. : 2

MODEL: C350 DATE: 29-Jul-06

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
5	584.1	98		100	
10	590.1	99			
15	591.6	99			
20	593.4	100			
25	593.2	100			
30	592.5	100			
35	594.3	100			
40	594.3	100			
45	594.3	100			
50	593.7	100			
55	595.4	100			
60	595.4	100			
65	595.4	100			
70	595.4	100			
75	595.2	100			
80	595.6	100			
85	595.2	100			
90	595.6	100			
95	595.2	100			
100	595.7	100			
105	595.3	100			
110	595.3	100			
115	595.7	100			
120	596.1	100			
125	596.1	100			
130	596.1	100			
135	596.1	100			
140	596.1	100			
145	596.1	100			
150	596.1	100			
155	596.1	100			
160	596.1	100			
165	595.7	100			
170	596.1	100			
175	596.1	100			
180					

Air setting 3/16"

COMPUTER INPUT DATA SHEET #1

Client: Jotul North America

Address: 55 Hutcherson Drive
Gorham, ME 04038

Phone: 1-800-797-5912 Fax: 1-207-772-0523

Run No.: 2 Date of Test: 7-29-06 Burn Rate: 1,131

Model No.: C350 ☐ min ☒ min-1.25 ☐ fan

Stove Type: ☐ Cat ☒ Non Cat ☐ Pellet ☐ 1.25-1.9 ☐ max ☐ insert

Dry Gas Meter Y Factor: .981 (0.000) (Data Sheet #2) Post Leak Rate: .009 (.000) (Data Sheet #2) cfm Time: 175 (000) (Data Sheet #2) min.

Dry Gas Meter Volume: 59.606 (00.000) (Data Sheet #2) cf

Stack Flow: 9.591 (00.000) (Data Sheet #2) dscfm Δ H: .182 (.000) (Data Sheet #2) in. H_2O

Maximum Vac.: 3.0 (0.0) (Data Sheet #2) Barometric Pressure: 30.07 (00.00) (Data Sheet #2) in. Hg

H_2O Captured: 67.3 (00.0) (Data Sheet #3) g

Front Half Catch % Of Total: 48.0 (00.0) (Data Sheet #6) % Total Particulate Catch: .4701 (0.0000) (Data Sheet #6) g

Flue Gas Moisture: 5.2155 (00.000) (Data Sheet #7) %

Particulate Emission: .1260 (0.0000) (Data Sheet #7) gr/dscf

Relative Humidity: 46.0 (00.0) (Data Sheet #8) % RH Ambient Moisture: 1.25 (0.00) (Data Sheet #8) % H_2O

Preburn Fuel Wt.: 30.9 (00.0) (Data Sheet #8) lbs. Coal Bed Wt.: 2.2 (00.0) (Data sheet #8) lbs. Test Fuel Wt.: 8.8 (00.0) (Data sheet #8) lbs.

Heat Output (EPA Default): 13,637.8 (00,000.0) (Data Sheet #8) BTU/hr

Kindling Fuel % Moisture (wet): 13.269 (00.000) (Data Sheet #10) % Pretest Fuel % Moisture (wet): 16.655 (00.000) (Data Sheet #10) %

Test Fuel % Moisture (dry): 21.025 (00.000) (Data Sheet #10 [wood stove] or #11 [pellet stove]) % Test Fuel % Moisture (wet): 17.372 %

Fuel Higher Heating Value (dry): ____ (0000) (Data Sheet #11) BTU/lb.

Stack Static Pressure: -.044 (+/- .000) (Data Sheet #12) in. H_2O

Average Ambient Temperature: 73 (00) (Data Sheet #14) °F Stove Temperature Change: -34.7 (+/- 000.0) (Data Sheet #14) °F

Start time = 1650
End time = 1945

Meter Temp = 79 / 539

52 @ 40

METER BOX DATA SHEET PAGE # 2

Page: 1 of 2

UNIT: Jotul C350 RUN: 2 DATE: 7-29-06

Meter Box: 5H Y Factor: .981

Leak checks: 15 " Hg @ .006 cfm _____ " Hg @ _____ cfm

15 " Hg @ .009 cfm _____ " Hg @ _____ cfm

Inject SO^2 @ 100 cc/min. Nozzle: Probe @ 3/8 " od Initial Volume: 1,500

ROTO: PRESS: .17			SAMPLING RATIO: 29 : 1				BP: 30.08		
MIN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
0	1650	584.000	———	8,781	.15	74	400	74	1.0
5	55	585.500	———	13,998	.38	76	250	76	3.0
10	1700	587.930	587.930	9.980	.20	77	350	77	1.0
15	05	589.674	589.674	9.961	.19	78	350	78	1.0
20	10	591.425	591.425	9.297	.17	78	375	78	2.0
25	15	593.059	593.059	9.961	.19	78	350	78	2.0
30	20	594.809	594.809	10.707	.22	79	325	79	2.0
35	25	596.701	596.701	10.707	.22	79	325	79	2.0
40	30	598.593	598.593	10.707	.22	79	325	79	2.0
45	35	600.485	600.485	10.707	.22	79	325	79	2.0
50	40	602.377	602.377	10.688	.22	80	325	80	2.0
55	45	604.276	604.276	10.688	.22	80	325	80	2.0
ROTO PRESS: .17			TOTALS:	126,182	2.60	937	BP.: 30.08		
60	1750	606.175	606.175	10.688	.22	80	325	80	2.0
65	55	608.074	608.074	10.688	.22	80	325	80	2.0
70	1800	609.973	609.973	9.924	.19	80	350	80	2.0
75	05	611.736	611.736	9.924	.19	80	350	80	2.0
80	10	613.500	613.500	9.924	.19	80	350	80	2.0
85	15	615.263	615.263	9.924	.19	80	350	80	2.0
90	20	617.027	617.027	9.924	.19	80	350	80	2.0
95	25	618.790	618.790	9.263	.17	80	375	80	2.0
100	30	620.437	620.437	8.684	.15	80	400	80	2.0
105	35	621.980	621.980	8.684	.15	80	400	80	2.0
110	40	623.523	623.523	8.684	.15	80	400	80	2.0
115	45	625.067	625.067	8.684	.15	80	400	80	2.0
			TOTALS:	114,995	2.16	960	MAX VACC =		
TOTAL Cu Ft.			TOTALS:	241,177	4.76	1897	AVG. BP:		

Fan?

METER BOX DATA SHEET PAGE # 2

Page: 2 of 2

UNIT: Jotul C350 RUN: 2 DATE: 7-29-06

Meter Box: 5H Y Factor: .981

Leak checks: 15 " Hg @ .006 cfm _____ " Hg @ _____ cfm

15 " Hg @ .009 cfm _____ " Hg @ _____ cfm

Inject SO^2 @ 100 cc/min. Nozzle : Probe @ 3/8 " od Initial Volume: 1.500

ROTO: PRESS: .17 SAMPLING RATIO: 29 : 1 BP: 30.05

MIN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	1850	626.612	626.612	8.675	.15	80	400	80	2.0
125	55	628.157	628.157	8.675	.15	80	400	80	2.0
130	1900	629.702	629.702	8.675	.15	80	400	80	2.0
135	05	631.247	631.247	8.675	.15	80	400	80	2.0
140	10	632.792	632.792	8.675	.15	80	400	80	2.0
145	15	634.337	634.337	8.675	.15	80	400	80	2.0
150	20	635.882	635.882	8.675	.15	80	400	80	2.0
155	25	637.427	637.427	8.675	.15	80	400	80	2.0
160	30	638.972	638.972	8.675	.15	80	400	80	2.0
165	35	640.516	640.516	8.675	.15	80	400	80	2.0
170	40	642.061	642.061	8.675	.15	80	400	80	2.0
175	45	643.606	643.606	8.675	.15	80	400	80	2.0
ROTO PRESS:			TOTALS:		1.80	(960)	BP.:		
180									
185									
190									
195									
200									
205									
210									
215									
220									
225						2857			
230				104.100	6.56				
235						(79)			
			TOTALS:	345.277			MAX VACC =		3.0
TOTAL Cu Ft.		59.606	TOTALS:	9,591	.182	539	AVG. BP:		30.07

PARTICULATE CATCH / MOISTURE DATA SHEET # 3

UNIT : Jotul C350 RUN : 2 DATE : 7-29-06

SCALE CHECK	LEVEL	ZEROED
INITIAL :	✓	✓
FINAL :	✓	✓

SCALE	WEIGHT
295.0 g	295.0
590.0 g	590.0
885.0 g	885.0

IMPINGER	#1	#2	#3	#4
FINAL WT	671.1	579.8	485.0	914.0
INITIAL WT	614.9	577.5	483.7	906.5
NET WT GRAMS	56.2	2.3	1.3	7.5

TOTAL CATCH : 67.3 GRAMS H_2O

FRONT HALF

FILTER #	70F	
FINAL WT g	.8246	
INITIAL WT g	.6688	
NET WT g	.1558	

BEAKER #	186
DESC.	ACETONE
FINAL WT g	106.1642
INITIAL WT g	106.0938
NET WT g	.0704
VOL. DESC. ml	75

BACK HALF

FILTER #	70B	
FINAL WT g	.3731	
INITIAL WT g	.3386	
NET WT g	.0345	

BEAKER #	187	188	189	190	
DESC.	ACETONE	METHCHLOR	H_2O	H_2O	
FINAL WT g	105.7010	104.8478	103.2320	103.8762	
INITIAL WT g	105.5775	104.8055	103.2085	103.8500	
NET WT g	.1235	.0423	.0235	.0262	(.0497)
VOL. DESC ml	150	75	125	140	(265)

FILTER TARE WEIGHTS DATA SHEET #4-1

Into Dessicator : Date : 10-27-05 Time : 9:30 By : KV

Manufacturer S & S Grade : # 25 Glass Front Size : 11 cm Lot No. : ZB921

Back Size: 8.2 cm Lot No. : B1044632

	DATE: 10-31	BY: KV	DATE: 11-1	BY: KV	DATE: 11-2	BY: KV
FILTER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
61 F	.6707	0936	.6708	0922	/	
62 F	.6645	0936	.6647	0923	/	
63 F	.6641	0937	.6642	0923	/	
64 F	.6703	0937	.6706	0924	/	
65 F	.6688	0938	.6689	0924	/	
66 F	.6628	0939	.6629	0925	/	
67 F	.6700	0939	.6704	0925	/	
68 F	.6676	0940	.6679	0926	/	
69 F	.6699	0940	.6702	0926	/	
70 F	.6683	0941	.6688	0927	/	
61 B	.3357	0926	.3378	0906	.3381	0927
62 B	.3399	0920	.3398	0906	/	
63 B	.3395	.0921	.3394	0907	/	
64 B	.3363	.0922	.3360	0907	/	
65 B	.3359	.0923	.3361	0908	/	
66 B	.3361	.0924	.3366	0908	/	
67 B	.3363	0925	.3364	0909	/	
68 B	.3384	0926	.3383	0909	/	
69 B	.3364	0927	.3362	0910	/	
70 B	.3387	0928	.3386	0910	/	

Checked by: C. Washington Date: 11-2-05 Time: 1055

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH
10-31	0915	KV	63	78	45
11-1	0906	KV	64	78	45
11-2	0927	KV	60	74	48

BEAKER TARE WEIGHTS DATA SHEET #4-2

Into Dessicator: Date : 11-25-05 Time : 1015 By : Cp W,

	DATE: 11-27-05	BY: KV	DATE: 11-28-05	BY: Cp	DATE:	BY:
BEAKER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
176	105.2089	1150	105.2094	1015	✓	
177	105.0934	1151	105.0939	1016	✓	
178	104.0207	1152	104.0211	1017	✓	
179	103.9995	1153	104.0000	1018	✓	
180	104.1371	1153	104.1375	1020	✓	
181	103.8770	1154	103.8775	1021	✓	
182	103.1315	1154	103.1320	1022	✓	
183	103.8049	1155	103.8053	1023	✓	
184	104.1704	1155	104.1709	1024	✓	
185	104.6349	1156	104.6353	1025	✓	
186	106.0933	1157	106.0938	1027	✓	
187	105.5771	1157	105.5775	1029	✓	
188	104.8050	1158	104.8055	1030	✓	
189	103.2081	1158	103.2085	1031	✓	
190	103.8495	1200	103.8500	1032	✓	
191	104.5248	1200	104.5252	1034	✓	
192	103.4592	1201	103.4595	1035	✓	
193	101.9848	1201	101.9852	1036	✓	
194	103.9911	1203	103.9916	1037	✓	
195	105.4652	1206	105.4653	1038	✓	
196	104.8893	1207	104.8898	1039	✓	
197	104.9687	1207	104.9690	1040	✓	
198	104.5900	1208	104.5905	1041	✓	
199	106.2448	1209	106.2452	1044	✓	
200	104.7527	1209	104.7530	1045	✓	

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH	
11-27-05	11:45	KV	59	73	43	Checked by : KV
11-28-05	1000	Cp	58	72	42	Date : 11-30
						Time : 0955

BLANK PROCESSING DATA SHEET # 5

UNIT : Jotul C350 RUN : 2 DATE : 7-29-06

BLANKS DONE : 10-11-2005

BEAKER	A	B	C
	200 ml ACETONE	75 ml DICHLOR	200 ml WATER
	FISHER OPTIMA LOT # 023283	FISHER OPTIMA LOT # 035941	DWNA, Inc. Sparklettes Distilled
FINAL WEIGHT	108.9008	106.3077	106.9670
TARE WEIGHT	108.8995	106.3066	106.9645
NET WEIGHT	.0013	.0011	.0025

TARE BEAKERS INTO DESC : TIME : 1900 DATE : 10-2-2005

DATE : 10-5 BY : CP DATE : 10-6 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.8996	0912	108.8995	1001	✓	
B	106.3065	0913	106.3066	1002	✓	
C	106.9642	0914	106.9645	1003	✓	

FINAL BEAKERS INTO DESC : TIME : 1000 DATE : 10-8-05

DATE : 10-10 BY : CP DATE : 10-11 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.9010	1348	108.9008	1105	✓	
B	106.3076	1349	106.3077	1106	✓	
C	106.9675	1350	106.9670	1109	✓	

TARE QC

DATE	TIME	BY	WB	DB	%
10-5	0840	CP		74	44
10-6	0930	CP		77	47

FINAL QC

DATE	TIME	BY	WB	DB	%
10-10	1330	CP		76	48
10-11	1020	CP		77	46

WOODSTOVE DATA SHEET # 4-3 : CONSTANT WEIGHTS

UNIT : JotV C350 RUN : 2 DATE : 7-29-06 Page : 1 of

Beaker #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
186	7-30	1600	CP	106.1637	8-1	1110	CP	106.1642	8-2	1826	CP				
187	7-30	1600	CP	105.7023	8-1	1111	CP	105.7015	8-2	1821	CP	105.7010	8-3	1146	CP
188	7-30	1600	CP	104.8526	8-1	1112	CP	104.8482	8-2	1822	CP	104.8478	8-3	1147	CP
189	7-30	1600	CP	103.2315	8-1	1113	CP	103.2320	8-2	1823	CP				
190	7-30	1600	CP	103.8758	8-1	1114	CP	103.8762	8-2	1825	CP				

Filter #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
70F	7-29	2000	CP	.8251	7-30	1915	CP	.8246	7-31	0842	CP				
70B	7-29	2000	CP	.3735	7-30	1916	CP	.3731	7-31	0843	CP				

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	DB	%RH
1	7-30	1900	CP	75	48
2	7-31	0830	CP	77	42
3	8-1	1100	CP	78	46
4	8-2	1800	CP	77	49
5	8-3	1140	CP	76	44

Weighing Session	Date	Time	By	DB	%RH
6					
7					
8					
9					
10					

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 6-1-2006 Through	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
100.0001	9.9999	1.0000	.0999	CP	6-1	1020	78	43
100.0002	10.0000	.9999	.0999	CP	6-2	1810	75	48
100.0002	10.0000	.9998	.1000	MH	6-5	1300	76	45
100.0002	10.0001	1.0000	.0999	CP	6-6	0900	76	46
99.9996	10.0001	1.0000	.0998	CP	6-7	1015	76	49
100.0000	10.0002	1.0000	.0998	CP	6-12	915	77	46
99.9996	9.9999	1.0000	.0999	CP	6-13	1235	78	46
100.0003	9.9999	1.0001	.0999	CP	6-14	1230	76	49
100.0004	10.0001	1.0001	.1000	CP	6-15	0840	75	48
99.9999	10.0001	1.0002	.0998	CP	6-16	1020	77	48
99.9998	10.0001	1.0000	.0999	CP	7-29	1545	77	46
100.0000	10.0001	.9997	.0999	CP	7-30	1900	75	48
99.9997	10.0000	1.0000	.0999	CP	7-31	0830	77	42
99.9996	10.0002	1.0001	.0998	CP	8-1	1100	78	46
100.0000	10.0001	1.0000	.1000	CP	8-2	1800	77	49
99.9998	10.0001	1.0001	.0998	CP	8-3	1140	76	49
99.9998	10.0003	.9999	.0999	CP	8-4	2030	76	49
100.0000	10.0002	.9999	.0999	CP	8-5	1130	76	45

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 12-8-2005 Through 5-31-2006	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	.9999	.0998	CP	12-8	0900	67	38
100.0001	10.0001	1.0000	.0998	CP	12-27	1500	77	49
100.0000	10.0002	1.0000	.0999	KV	12-28	1125	70	48
100.0004	10.0003	1.0000	.1000	KV	12-29	1000	74	44
99.9999	10.0002	1.0000	.0999	KV	12-30	1030	76	42
99.9998	10.0002	1.0000	.0999	KV	12-31	1200	76	45
100.0003	10.0001	.9999	.0998	KV	1-1	1345	75	44
100.0004	10.0001	.9997	.0999	CP	1-2	1230	77	48
100.0003	10.0000	1.0001	.0999	CP	1-4	1430	74	44
100.0003	9.9999	1.0000	.0999	CP	1-5	1206	74	47
100.0002	9.9999	1.0000	.0999	CP	1-6	1000	77	49
100.0000	10.0001	.9999	.0997	KV	1-8	1000	71	41
100.0002	10.0000	1.0000	.0999	CP	1-9	1400	75	48
100.0000	10.0001	1.0000	.0999	CP	1-12	1200	74	47
100.0001	10.0001	.9999	.0998	CP	1-13	1500	73	49
99.9999	10.0003	.9998	.0998	CP	1-15	1230	69	49
100.0003	10.0001	1.0001	.1000	CP	1-16	1415	70	48
100.0003	10.0001	.9998	.0996	KV	1-24	1015	67	46
100.0003	10.0001	1.0000	.1000	KV	1-25	920	70	44
100.0001	10.0000	1.0000	.0999	CP	2-2	530	74	48
100.0003	10.0002	.9999	.0998	KV	2-2	0930	75	48
100.0004	10.0002	.9999	.0999	KV	2-3	0900	74	47
100.0001	10.0002	1.0000	.1000	CP	2-4	1100	77	42
100.0002	10.0000	1.0000	.1000	KV	2-6	1202	74	44
100.0000	10.0001	1.0000	.1000	KV	2-7	1119	73	43
99.9999	10.0001	1.0001	.0999	CP	2-8	1135	75	41
100.0002	10.0001	.9999	.0999	KV	2-10	0930	72	42
100.0000	10.0000	.9999	.0999	CP	2-13	0940	75	46
100.0001	10.0002	1.0000	.0999	KV	2-20	1200	71	44
100.0003	10.0001	.9999	.0999	CP	3-1	1216	78	43
100.0004	10.0001	1.0000	.0999	CP	3-2	1515	74	49
100.0001	10.0003	1.0001	.1001	KV	3-3	1100	74	44
100.0004	10.0002	1.0000	.0998	CP	3-6	1300	75	48
100.0002	10.0001	1.0002	.0999	CP	3-7	1905	75	48
100.0002	9.9999	.9999	.0999	CP	5-24	1600	78	46
100.0004	10.0001	.9999	.0999	CP	5-25	0830	76	45
100.0000	9.9999	.9997	.0999	CP	5-26	0840	74	47
100.0003	9.9999	1.0000	.0998	CP	5-30	1220	73	48
100.0002	10.0001	.9999	.1000	CP	5-31	1015	78	46

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 10-21-2005 Through 12-6-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	1.0000	.0999	Clp	10-21	0900	74	44
100.0000	10.0001	1.0000	.0999	Clp	10-22	1630	78	46
99.9998	10.0000	.9998	.0998	Clp	10-23	1130	74	49
99.9996	10.0000	.9998	.0997	KV	10-24	9:00	77	52
100.0000	10.0003	1.0000	.0999	KV	10-25	9:30	76	49
99.9999	10.0001	.9999	.0997	KV	10-26	9:50	70	48
99.9998	10.0000	.9999	.0998	KV	10-27	8:25	75	47
99.9996	10.0003	1.0001	.0999	KV	10-28	10:45	68	47
99.9999	10.0001	1.0000	.1000	Clp	10-29	1900	75	44
99.9998	10.0003	1.0000	.0999	Clp	10-30	1145	72	42
99.9999	10.0000	0.9998	.0998	KV	10-31	9:00	78	44
100.0001	10.0000	0.9997	.1000	KV	11-1	0850	75	42
99.9996	9.9998	.9998	.0996	KV	11-2	0915	72	49
99.9996	10.0000	1.0000	.0998	KV	11-3	1429	73	46
99.9997	10.0000	.9999	.0999	KV	11-4	1100	72	42
100.0002	10.0000	1.0001	.1000	Clp	11-5	1015	69	44
99.9998	10.0001	1.0000	.0999	KV	11-7	0930	75	41
99.9998	10.0000	.9998	.0999	KV	11-9	1111	70	48
100.0002	10.0001	.9999	.1000	KV	11-10	1040	73	47
99.9999	10.0001	.9999	.0998	Clp	11-12	1600	67	49
100.0001	10.0000	1.0000	.0999	Clp	11-13	1430	74	47
99.9999	10.0000	1.0000	.0999	Clp	11-15	1500	72	44
100.0002	10.0000	.9999	.0999	KV	11-16	0815	70	44
100.0005	10.0000	1.0000	.0999	Clp	11-17	0930	72	46
100.0004	10.0002	1.0001	.1000	Clp	11-18	1600	72	48
100.0003	10.0001	.9999	.0999	Clp	11-20	1100	68	47
100.0004	10.0002	1.0000	.1000	Clp	11-21	1200	74	44
100.0002	10.0002	.9999	.0998	Clp	11-22	1030	74	42
99.9999	10.0000	1.0000	.0999	Clp	11-25	1000	69	47
100.0002	10.0001	.9999	.0999	KV	11-26	1330	72	47
100.0000	10.0001	.9999	.0999	KV	11-27	1145	73	43
100.0001	10.0002	1.0000	.1000	Clp	11-28	1000	72	42
100.0004	10.0000	1.0000	.0998	Clp	11-29	0940	72	42
99.9999	10.0001	1.0001	.0999	KV	11-30	0930	70	44
100.0001	10.0001	1.0000	.0998	Clp	12-1	0900	70	41
100.0000	10.0000	.9999	.1000	Clp	12-2	1340	72	42
100.0000	10.0000	.9998	.0999	Clp	12-3	1400	68	43
99.9999	9.9998	.9999	.0996	Clp	12-5	1620	71	45
99.9997	10.0001	1.0000	.0994	Clp	12-6	1430	69	44

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 07/15/05 Through 10-20-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9998	9.9994	.9999	.0998	[illegible]	07/15	2000	78	46
99.9997	9.9998	1.0000	.1000	[illegible]	07/19	2250	78	46
100.0000	9.9994	.9999	.0999	[illegible]	07/20	0740	78	46
100.0000	9.9999	1.0000	.1000	[illegible]	07/21	2100	78	46
99.9998	9.9998	.9999	.1000	[illegible]	07/24	2200	78	46
100.0001	10.0000	1.0000	.1000	[illegible]	07/27	1515	78	49
99.9998	10.0000	.9998	.1000	[illegible]	07/28	0600	78	49
99.9999	10.0001	1.0000	.1000	[illegible]	07/29	1210	78	49
100.0000	10.0000	1.0001	.0998	CW	9-6	0930	74	48
100.0000	9.9998	.9998	.0996	CW	9-7	0955	72	47
99.9999	10.0000	1.0001	.1000	CW	9-8	1010	78	43
99.9999	10.0001	.9999	.0999	CW	9-9	0945	75	48
99.9996	9.9999	1.0000	.1000	CW	9-10	1630	75	48
99.9998	9.9999	1.0000	.0999	CW	9-11	1300	75	44
99.9997	10.0000	1.0000	.0998	CW	9-12	0920	74	48
99.9998	10.0001	.9999	.0999	CW	9-13	0945	74	47
99.9996	10.0001	.9999	.0999	CW	9-14	1400	77	46
99.9997	10.0001	1.0001	.0999	CW	9-15	0815	75	48
99.9996	10.0000	1.0000	.1000	CW	9-16	0955	76	49
99.9998	10.0001	.9999	.0998	CW	9-17	1200	76	45
99.9997	9.9998	.9999	.0998	CW	9-18	1430	73	47
100.0004	10.0002	1.0000	.0998	CW	9-19	0810	74	44
100.0000	10.0000	1.0000	.1000	CW	9-20	1910	77	44
100.0000	10.0000	1.0000	.0998	CW	9-21	1620	78	46
100.0000	10.0001	1.0000	.0999	CW	9-22	1420	76	49
100.0004	10.0003	1.0000	.0997	CW	9-23	1300	72	46
99.9998	10.0001	1.0000	.0999	CW	10-1	1830	74	47
100.0000	10.0000	1.0000	.0999	CW	10-2	1830	69	47
100.0001	10.0001	.9998	.0999	CW	10-5	0840	74	47
99.9998	10.0001	1.0000	.0999	CW	10-6	0930	77	47
99.9998	10.0002	.9999	.1000	CW	10-8	1340	75	45
100.0000	10.0002	.9999	.0997	CW	10-10	1330	76	48
99.9999	10.0000	1.0001	.1000	CW	10-11	1020	77	46
99.9998	10.0002	.9999	.1000	CW	10-12	1000	74	44
100.0001	10.0001	1.0000	.0997	CW	10-13	1020	70	48
99.9999	10.0000	1.0001	.0999	CW	10-14	1000	70	48
100.0000	10.0001	.9999	.0999	CW	10-15	1440	72	46
99.9997	9.9999	1.0000	.1000	CW	10-20	1000	77	49

NET PARTICULATE CATCH CALCULATION DATA SHEET #6

UNIT: Sotul C350 RUN: 2 DATE: 7-29-06

Blank Audit by C Charlington 10-14-2005

BLANK CALCULATIONS

Acetone :	.0013	g ÷	200	ml =	.000007	g/ml
Dicholoromethane :	.0011	g ÷	75	ml =	.000015	g/ml
Distilled Water :	.0025	g ÷	200	ml =	.000013	g/ml

FRONT HALF CATCH

FILTERS : .1558 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .1558 g

BEAKERS : .0704 (Total Catch) g - 75 (ml Acetone) (.000007 → .0005 g) (Blank Value / ml Acetone) = .0699 g

TOTAL FRONT HALF CATCH : .2257 g

BACK HALF CATCH

FILTERS : .0345 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .0345 g

BEAKERS :

Acetone : .1235 (Total Catch) g - 150 (ml Acetone) (.000007 → .0011 g) (Blank Value / ml Acetone) = .1224 g

Extract : .0423 (Total Catch) g - 75 (ml Dichloromethane) (.000015 → .0011 g) (Blank Value / Dichloromethane) = .0412 g

Water : .0497 (Total Catch) g - 265 (ml Water) (.000013 → .0034 g) (Blank Value / Water) = .0463 g

TOTAL BACK HALF CATCH : .2444 g

TOTAL CATCH : .4701 g

% FRONT HALF : 48.0 %

CALCULATIONS DATA SHEET # 7

UNIT : Jotul C350 RUN : 2 DATE : 7-29-06

1) $Vm(std) = \dfrac{(59.606\ Vm)(17.64)(.981\ mcf)\left(30.07" Hg + \frac{.182" H_2O}{13.6}\right)}{(539\ TmA)} = \dfrac{57.5699}{000.0000}$ dscf

2) $Vw(std) = (.04707)(67.3\ ml\ H_2O) = \dfrac{3.1678}{00.0000}$ scf

3) $Asw = \dfrac{(3.1678\ scf)}{(3.1678\ scf + 57.5699\ dscf)} = \dfrac{.0522}{.0000}$ Bws × 100 = $\dfrac{5.2155}{00.0000}$ % H_2O

4) $Cs = \dfrac{(.4701\ g.)}{(57.5699\ dscf)}(15.43) = \dfrac{.1260}{0.0000}$ gr / dscf

5) Estimated g / hr = $\dfrac{(.4701\ g.)}{(57.5699\ dscf)}\left(\dfrac{9.591}{00.0000}\ dscfm\right)(60) = \dfrac{4.6990}{00.0000}$ g / hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf =	meter correction factor (Y factor) of meter box used for test	(p. 2)	(0.000 mcf)
" Hg =	average barometric pressure during test	(p. 2)	(00.00 " Hg)
" H_2O =	average delta H for test	(p. 2)	(.000 " H_2O)
TmA =	average meter temperature for test in degrees Absolute	(p. 2)	(000 TmA)
ml H_2O =	total water caught during test	(p. 3)	(000.0 ml H_2O)
g. =	total particulate catch for test	(p. 6)	(00.0000 g.)
dscfm =	average stack flow during test	(p. 2)	(00.000 dscf)

TEST DATA SHEET # 8

UNIT : Jotul C350 RUN : 2 DATE : 7-29-06

Test Chamber Air Velocity Start : Ø Stop : Ø Avg.: Ø

Wet Bulb / Dry Bulb

Pre : WB : 60 DB : 74 = 44 % RH 1.25 % H_2O

Post : WB : 59 DB : 71 = 48 % RH 1.25 % H_2O

Average : 46.0 % RH 1.25 % H_2O

Empty Stove Weight (lbs) : — w/ stack & oil seal : Wet : — Dry : 352.1

Kindling Weight (lbs) : Paper : .1 Wood : 2.7

Preburn Fuel Weight : 10.8 + 9.5 + 7.9 Total : 28.2

Kindling & Preburn Fuel Weight (wood only) (lbs) : **Total** : 30.9

Coal Bed Wt Range (lbs) : 2.2 - 1.8 **Scale** : 354.3 - 353.9

Upper : .25 × fuel weight : Always round DOWN to nearest tenth

Lower : .20 × fuel weight : Always round UP to nearest tenth **Actual Coal Bed Weight** : 2.2

Maximum Coal Bed Removal (lbs) : ((2.2 (Upper) + 1.8 (Lower)) ÷ 2) .25 = .5 (round down to nearest tenth)

Test Fuel (.75" × 1.5" × 5" spacers) = 16 pcs

Dimensions	Length in inches	No. Pcs	Weight in lbs	% of Load
2" × 4"	17.0	4	8.8	100.0
4" × 4"	—	—	—	—

Test Fuel Weight : 8.8 lbs

Estimated Dry Burn Rate :

$$\frac{8.8 - (8.8 \times .17372)}{2.2046} \times \frac{60}{\frac{175}{\text{TIME}}} = 1.131 \text{ kg / hr}$$

Estimated BTU's/hr : 19,140 × $\frac{63}{100}$ × $\frac{1.131}{\text{DBR}}$ = 13,637.8 BTU's/hr

EPA Default Efficiencies : (Non-cat : 63) Cat : 72 Pellet : 78

WOOD STOVE OPERATING DATA PAGE #9

Unit : Jotul C350 Run : 2 Date : 7-29-06

FIRE STARTED: 1245

WARM UP AND PREBURN:

PRIMARY AIR : Set wide open for all warm-up / preburn fuel charges. Then set to 3/16" at start of preburn.

SECONDARY AIR : N/A CAT BYPASS : N/A

CHARCOAL BED PREPARATION :

Raked and leveled prior to each warm-up / preburn charge. At 1 ½ min. prior to loading last fuel, raked and leveled. In stove 25 sec.

TEST:

DOOR wide open during loading 0 min. 40 sec.

PRIMARY AIR : Opened full for first 5 min., then set to run setting of 3/16".

SECONDARY AIR : N/A CAT BYPASS : N/A

FAN:

ON / OFF during warm-up

ON / OFF first 30 minutes of test

Fan speed set at Low

ON / OFF during preburn

ON / OFF balance of test run

WOOD DATA: KINDLING: A mix of the grades listed below:

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2x4	Manke/Tacoma	Std. or better	s. grn D fir
TEST:	2x4	Packwood	# 2 or better	s. grn D fir
	4x4	Packwood	# 2 or better	s. grn D fir

PELLET FUEL MANUFACTURER : N/A BRAND : N/A

All Grades WCLB rules:

WARM UP INFORMATION:

All pre-burn / warm up fuel pieces were either 10 or 16 inches.

1st warm up / pre-burn fuel charge (10.8 lbs.) added at 1255

2nd warm up / pre-burn fuel charge (9.5 lbs.) added at 1400

3rd warm up / pre-burn fuel charge (7.9 lbs.) added at 1455

4th warm up / pre-burn fuel charge (lbs.) added at

5th warm up / pre-burn fuel charge (lbs.) added at

TEST DATA SHEET #10

Unit : Jotul C350 Run : 2 Date : 7-29-06

Room Temperature : 68 °F Correction Factor : Ø

Uncorrected Values are corrected for room temperature : Yes _____ No ✓

Time Test Fuel moisture reading taken : 1520

Calibration Checks : X ✓ Y ✓ 12.0 12.2 22.0 22.0

pc #	Dimen.	Use	TOP		BOTTOM		SIDE		Average Corrected
			Uncor.	Cor.	Uncor.	Cor.	Uncor.	Cor.	
1	2"×4"×8'	K	14.5	15.5	15.0	16.0	15.0	16.0	15.833
2									
3									
4	2"×4"×8'	P	18.5	19.8	19.0	20.3	19.0	20.3	20.133
5	2"×4"×8'	P	20.0	21.4	20.0	21.4	19.0	20.3	21.033
6	2"×4"×8'	P	18.0	19.2	18.0	19.2	18.0	19.2	19.200
7	2"×4"×8'	P	19.0	20.3	18.0	19.2	18.0	19.2	19.567
8	2"×4"×8'	P							79.933
9									
10									
11	2x4x17	T	18.0	19.2	18.0	19.2	18.0	19.2	19.200
12	"	T	19.0	20.3	19.5	20.9	19.5	20.9	20.700
13	"	T	19.0	20.3	19.0	20.3	19.5	20.9	20.500
14	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700
15									84.100
16									
17									
18									
19									
20	Spacers	T	21.5	23.1	21.0	22.5	21.0	22.5	22.700

Key for Use : K = Kindling P = Pretest Fuel T = Test Fuel

	KINDLING	PRETEST FUEL	TEST FUEL
Dry Moisture % :	15.833 %	19.983 %	21.025 %
Wet Moisture % :	13.469 %	16.655 %	17.372 %

To obtain Wet from Dry : $\frac{100 \times \%\text{ Dry Reading}}{100 + \%\text{Dry Reading}}$ = % Moisture, Wet Basis

Acceptable Ranges : 16 - 20 % wet: 19 - 25 % dry (17.5 - 22.5 on Meter Uncor. reading) at 70°

GAS DATA SHEET #12

WEIGHT: _____ DATE: 7-29-06

UNIT: Jotul C350 RUN: 2 PAGE: 1 OF

TIME	SCALE	FUEL	DROP	V.	CO_2	V.	O_2	V.	CO	STATIC	SO_2PPM
0 1650	363.1	8.8	—	.123	3.1	.685	17.1	.063	.62	-.036	400
5 55	362.6	8.3	.5	.167	4.2	.637	15.9	.073	.72	-.045	250
10 1700	362.4	8.1	.2	.130	3.3	.687	17.2	.040	.39	-.040	350
bal 16:00 15 05	362.1	7.8	.3	.135	3.4	.684	17.1	.037	.36	-.040	350
20 10	361.8	7.5	.3	.257	6.4	.556	13.9	.050	.49	-.046	375
25 15	361.3	7.0	.5	.210	5.3	.608	15.2	.039	.38	-.048	350
Fan ? 30 20	360.8	6.5	.5	.259	6.5	.557	13.9	.041	.40	-.050	325
35 25	360.4	6.1	.4	.304	7.6	.511	12.8	.046	.45	-.052	325
40 30	359.8	5.5	.6	.353	8.8	.465	11.6	.041	.40	-.054	325
43 35	359.2	4.9	.6	.353	8.8	.466	11.6	.037	.36	-.056	325
50 40	358.7	4.4	.5	.395	9.9	.426	10.6	.029	.28	-.057	325
53 45	358.2	3.9	.5	.340	8.5	.485	12.1	.019	.18	-.056	325
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.580	*****
60 1750	357.9	3.6	.3	.340	8.5	.486	12.1	.022	.21	-.055	325
65 55	357.4	3.1	.5	.376	9.4	.442	11.0	.039	.38	-.055	325
70 1800	357.1	2.8	.3	.353	8.8	.470	11.7	.030	.29	-.055	350
75 05	356.7	2.4	.4	.345	8.6	.484	12.1	.013	.12	-.055	350
80 10	356.4	2.1	.3	.313	7.8	.514	12.8	.015	.14	-.054	350
85 15	356.1	1.8	.3	.284	7.1	.539	13.5	.026	.25	-.053	350
90 20	356.0	1.7	.1	.266	6.7	.554	13.8	.030	.29	-.053	350
95 25	355.7	1.4	.3	.256	6.4	.562	14.0	.040	.39	-.051	375
100 30	355.6	1.3	.1	.213	5.3	.593	14.8	.068	.67	-.046	400
105 35	355.5	1.2	.1	.202	5.0	.606	15.1	.069	.68	-.044	400
110 40	355.4	1.1	.1	.197	4.9	.607	15.1	.077	.76	-.042	400
115 45	355.3	1.0	.1	.197	4.9	.605	15.1	.082	.81	-.038	400
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.601	*****
120 1850	355.2	.9	.1	.188	4.7	.607	15.1	.097	.96	-.037	400
125 55	355.1	.8	.1	.184	4.6	.606	15.1	.110	1.09	-.036	400
130 1900	355.0	.7	.1	.188	4.7	.610	15.2	.089	.88	-.036	400
135 05	354.9	.6	.1	.170	4.3	.608	15.2	.134	1.33	-.035	400
140 10	354.8	.5	.1	.168	4.2	.616	15.4	.125	1.24	-.035	400
145 15	354.8	.5	Ø	.166	4.2	.611	15.2	.137	1.36	-.035	400
150 20	354.7	.4	.1	.162	4.1	.617	15.4	.132	1.31	-.034	400
155 25	354.6	.3	.1	.164	4.1	.626	15.6	.109	1.08	-.034	400
160 30	354.5	.2	.1	.170	4.3	.623	15.6	.096	.95	-.033	400
165 35	354.4	.1	.1	.163	4.1	.628	15.7	.104	1.03	-.033	400
170 40	354.4	.1	Ø	.154	3.9	.634	15.8	1.10	1.09	-.033	400
175 1945	354.3	Ø	.1	.147	3.7	.645	16.1	.102	1.01	-.033	400
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.414	*****
TOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-1.595	*****

-.044

PREBURN DATA SHEET #13

UNIT: Jotul C350 RUN: 2 DATE: 7-29-06 PAGE: 1 of 1

TIME	SCALE	DROP	STACK	TOP	LF SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC/CAT	AMBIENT	STATIC	COMMENTS
0 1540	355.2	—	389	739	395	566	493	641	1160	1064	83	-.064	PREBURN START: # 9 UP
5 45	355.0	.2	275	650	386	491	481	597	1040	937	82	-.053	COAL BED SCALE RANGE:
10 50	354.9	.1	247	597	368	454	462	572	989	889	80	-.050	354.3 → 353.9
15 55	354.9	0	234	572	362	438	456	561	971	862	79	-.048	PRIMARY AIR: 3/16"
20 1600	354.7	.2	229	542	349	411	440	543	940	831	79	-.046	SECONDARY AIR: N/A
25 05	354.7	0	222	515	336	393	429	530	921	802	78	-.045	FAN: LOW
30 10	354.7	0	213	490	323	376	416	514	950	771	77	-.044	PUMPS ON AT: 1610
35 15	354.7	0	202	465	314	359	404	495	972	746	77	-.042	CHECK WB/DB:
40 20	354.6	.1	196	447	307	344	393	481	901	724	77	-.041	
45 25	354.6	0	191	426	298	332	384	465	851	706	77	-.040	
50 30	354.5	.1	185	407	290	317	371	450	807	665	76	-.039	
55 35	354.4	.1	181	389	284	309	364	438	769	652	76	-.038	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	
00 1640	354.4	0	176	373	275	299	352	424	794	629	75	-.037	344.6
05 45	354.4	0	175	358	270	291	344	410	607	592	75	-.036	
10 50	354.3	.1	175	345	265	282	337	398	911	567	75	-.036	

Jotul C350

Temperature Data Sheet #14

Run 2
7/29/06

Time	Stack	Top	LT Side	Back	Rt Side	Bottom	Firebox	Sec/Cat	Ambient	Tube Furn	Smpl Box	Smpl Out	C-Gas Box	C-Gas Out	SO2 Out
********	Chn 103	Chn 104	Chn 105	Chn 106	Chn 107	Chn 108	Chn 109	Chn 110	Chn 111	Chn 112	Chn 113	Chn 114	Chn 115	Chn 116	Chn 117
0	175	345	265	282	337	398	911	567	75	1417	229	62	235	36	38
5	282	332	258	306	330	394	938	460	74	1404	229	59	238	37	38
10	189	332	251	300	321	383	932	527	73	1392	230	42	241	37	38
15	178	326	241	289	312	375	937	559	73	1381	231	41	243	37	38
20	211	361	231	278	303	369	849	910	72	1370	232	41	245	37	38
25	217	379	224	273	296	363	795	780	71	1360	232	40	246	37	38
30	234	407	218	275	292	357	736	852	71	1351	233	40	245	37	38
35	252	443	215	244	293	351	684	961	72	1345	234	39	244	37	38
40	274	507	217	251	297	339	663	1073	73	1339	235	39	246	37	38
45	278	536	216	259	303	330	680	1070	72	1334	235	39	247	38	38
50	288	577	222	271	311	322	701	1152	73	1331	236	39	248	38	38
55	280	583	230	283	320	314	675	1005	73	1329	237	39	248	38	38
60	269	572	235	294	328	308	674	965	73	1328	237	39	248	38	38
65	276	570	245	303	334	305	685	977	73	1326	237	40	247	38	38
70	271	569	254	314	338	302	698	995	74	1326	238	40	247	38	38
75	269	575	262	323	341	300	724	1015	74	1325	238	40	247	38	37
80	264	577	266	327	348	298	756	972	74	1326	238	41	246	38	37
85	259	570	271	331	351	298	873	920	73	1327	238	41	246	38	37
90	252	556	273	329	354	298	873	901	74	1328	239	41	246	37	37
95	245	538	275	328	356	298	876	874	74	1329	240	40	246	37	37
100	230	510	269	326	354	300	846	842	74	1331	240	40	246	37	37
105	219	485	269	325	353	302	793	821	74	1334	242	41	246	37	37
110	212	464	270	323	351	304	764	800	74	1336	244	41	246	37	37
115	207	445	269	319	348	306	740	790	74	1337	245	41	247	37	36
120	203	430	264	315	345	307	717	760	73	1348	245	41	247	37	36
125	201	416	264	311	341	309	693	740	73	1348	245	41	247	37	36
130	198	404	257	306	337	311	668	727	73	1349	245	41	246	37	36
135	196	396	260	300	333	313	635	702	73	1350	245	42	246	37	36
140	194	388	252	294	328	313	609	688	73	1349	243	42	246	37	36
145	192	380	250	290	323	314	597	677	73	1347	242	42	246	37	36
150	191	370	253	285	318	314	576	657	73	1343	242	43	246	36	36
155	188	362	249	282	313	313	548	642	73	1341	242	43	247	36	36
160	188	355	247	281	309	311	532	636	72	1339	241	43	247	36	35
165	187	350	244	279	304	309	519	625	72	1338	241	43	247	36	35
170	184	343	245	277	298	307	507	606	72	1339	241	43	248	36	35

Jotul C350

Temperature Data Sheet #14

Run 2
7/29/06

175	183	335	244	275	294	305	496	597	72	1339	240	41	248	36	35

TEMPERATURE DATA SHEET #14A

		TEST TIME	175		
STACK AVG	**226**	TOP AVG	**447**	LT SIDE AVG	**249**
BACK AVG	**296**	RT SIDE AVG	**325**	BOTTOM AVG	**323**
FIREBOX AVG	**719**	SEC/CAT AVG	**801**	AMBIENT AVG	**73**

END	**290.5**	
START	**325.2**	
	-34.7	DELTA T

CIRCLE: **LOSS / GAIN**

ZERO / SPAN CHECK DATA SHEET #15-1

Date : 7-29-06 Analyte : CO_2 (15-1)

Unit : Jotul C350 Run # : 2

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % CO_2 Cyl. Press. : 975 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 407069

Range : 0 - 25.0 % CO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % CO_2

EPA Control Limits = ± 2.5% of 25.0 % CO_2 = ± 0.625 % CO_2

Method 28 A = ± .2 % of 25.0 % CO_2 = ± .05 % CO_2

PRE RUN Audit : by : C. Wadsworth Time : 1500 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.2	.002	.062	.062	.248
SPAN	50.0	.500	12.50	49.8	.498	12.447	-.053	-.212

POST RUN Audit : by : C. Wadsworth Time : 2000 Temp : 71 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	.037	.037	.149
SPAN	50.0	.500	12.50	50.0	.500	12.497	-.003	-.012

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-2

Date : 7-29-06 Analyte : O_2 (15-2)

Unit : Jotul C350 Run # : 2

Zero Cyl. # : 168TAC 3A Conc. : 0.00 % O_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % O_2 Cyl. Press. : 975 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : TELEDYNE Model : 320 A SN : 37400

Range : 0 - 25.0 % O_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % O_2

EPA Control Limits = ± 2.5% of 25.0 % O_2 = ± 0.625 % O_2

Method 28 A = ± .2 % of 25.0 % O_2 = ± .05 % O_2

PRE RUN Audit : by : C Wadmyk Time : 1500 Temp : 80 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.000	-.010	-.010	-.039
SPAN	12.50	.500	12.50	12.5	.500	12.471	-.029	-.115

POST RUN Audit : by : C Wadmyk Time : 2000 Temp : 71 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.000	-.010	-.010	-.039
SPAN	12.50	.500	12.50	12.5	.502	12.521	.021	.084

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-3

Date : 7-24-06 Analyte : CO (15-3)

Unit : Jotul C350 Run # : 2

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 4.99 % CO Cyl. Press. : 975 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 408005

Range : 0 - 10.0 % CO Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 10.0 % CO

EPA Control Limits = ± 2.5% of 10.0 % CO = ± 0. 25 % CO

Method 28 A = ± .2 % of 10.0 % CO = ± .02 % CO

PRE RUN Audit : by : C. Wadsworth Time : 1500 Temp : 80 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	-.006	-.006	-.059
SPAN	49.9	.499	4.99	49.9	.499	5.001	.011	.109

POST RUN Audit : by : C. Wadsworth Time : 2000 Temp : 71 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	-.016	-.016	-.159
SPAN	49.9	.499	4.99	49.9	.499	5.001	.011	.109

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-4

Date : 7-29-06 Analyte : SO_2 (15-4)

Unit : Jotul C350 Run # : 2

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 ppm SO_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC62184 Conc. : 1290 ppm SO_2 Cyl. Press. : 400 PSI

Certified by : AIR LIQUIDE Date : 01-29-01

Analyzer : Make : HORIBA Model : PIR-2000 SN : 403019

Range : 0 - 2500 ppm SO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 2500 ppm SO_2

EPA Control Limits = ± 2.5% of 2500 ppm SO_2 = ± 62.5 ppm SO_2

PRE RUN Audit : by : C Wadsworth Time : 1500 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.003	.786	.786	.031
SPAN	51.6	.516	1290	51.2	.512	1279.4	-10.600	.424

POST RUN Audit : by : C Wadsworth Time : 2000 Temp : 71 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.001	5.752	5.752	.230
SPAN	51.6	.516	1290	51.3	.513	1281.9	-8.100	-.324

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

QUALITY CHECKS DATA SHEET # 16

UNIT : Jotol C350 RUN : 2 DATE : 7-29-06

Thermocouple Check:

T/C # 1	— °F	T/C # 13	69.3 °F
T/C # 2	— °F	T/C # 14	68.9 °F
T/C # 3	68.7 °F	T/C # 15	69.3 °F
T/C # 4	66.1 °F	T/C # 16	68.6 °F
T/C # 5	65.5 °F	T/C # 17	67.6 °F
T/C # 6	65.6 °F	T/C # 18	72.1 °F
T/C # 7	65.6 °F	T/C # 19	67.5 °F
T/C # 8	65.5 °F	T/C # 20	— °F
T/C # 9	65.5 °F	T/C # 21	— °F
T/C # 10	65.6 °F	T/C # 22	— °F
T/C # 11	65.2 °F	T/C # 23	— °F
T/C # 12	70.2 °F	T/C # 24	— °F

Thermocouple Readout:

Pretest zero and span check and calibration		post test zero and span	% difference
ZERO 0.0 °F	Adj. to 0.0 °F	ZERO -0.2 °F	Difference -0.1 %
SPAN 2000.4 °F	Adj. to 2000.0 °F	SPAN 2000.6 °F	Difference .030 %

Thermocouple Readout Pretest Linearity Check:

0	= 0.0 °F	200	= 199.9 °F	400	= 399.6 °F
600	= 599.6 °F	800	= 799.6 °F	1000	= 999.7 °F
1200	= 1199.6 °F	1400	= 1399.4 °F	1600	= 1599.5 °F
1800	= 1799.8 °F	2000	= 2000.0 °F		

Sample Train Leak Check	Pre X	Post ✓
C-gas Train Leak Check	Pre ✓	Post ✓
SO_2 Train Leak Check	Pre ✓	Post ✓
Static Gauge Zero Check	Pre X	Post ✓

Scale Check Pre : 364.5 − 354.5 = 10.0

Post : 363.7 − 353.7 = 10.0

Stack Cleaned Prior to Test Run : YES ____ NO X

TABLE 1 ----- RAW DATA

CLIENT : Jotul TEST No. : 3

MODEL: C350 DATE: 31-Jul-06

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	644.000	0.150	77	0.53	4.30	350
5	645.500	0.240	78	0.51	5.90	275
10	647.438	0.130	79	0.45	6.50	375
15	648.865	0.130	80	0.66	8.20	375
20	650.298	0.130	80	0.54	9.50	375
25	651.731	0.170	80	0.24	11.60	325
30	653.383	0.170	80	0.32	10.40	325
35	655.036	0.170	80	0.38	11.10	325
40	656.689	0.150	81	0.44	10.70	350
45	658.229	0.150	81	0.39	10.80	350
50	659.770	0.170	82	0.10	8.40	325
55	661.435	0.150	82	0.19	7.20	350
60	662.981	0.150	82	0.29	6.30	350
65	664.529	0.150	82	0.35	6.30	350
70	666.076	0.150	82	0.36	6.30	350
75	667.624	0.130	83	0.57	5.20	375
80	669.074	0.130	83	0.57	5.20	375
85	670.524	0.130	83	0.66	4.60	375
90	671.974	0.130	83	0.67	4.60	375
95	673.424	0.150	83	0.70	4.50	350
100	674.978	0.150	83	0.75	4.10	350
105	676.531	0.150	83	0.77	4.00	350
110	678.084	0.150	83	0.81	3.80	350
115	679.638	0.150	83	0.88	3.60	350
120	681.191	0.150	83	0.91	3.50	350
125	682.745	0.150	83	0.88	3.50	350
130	684.298	0.150	83	0.84	3.40	350
135	685.852	0.150	83	0.76	3.10	350
140	687.405	0.150	83	0.78	3.10	350
145						

TABLE 2---RAW DATA

CLIENT : Jotul TEST No. 3

MODEL: C350 DATE: 31-Jul-06

METER CAL. FACTOR (Y) -------	0.981		Wt. WOOD BURNED(LB) -------	8.7	Lbs
BAROMETRIC PRESS.(Pb) -------	30.06	in Hg	WET,FUEL MOISTURE % -------	17.338	%
LEAK RATE POST (Lp) -------	0.014	cfm	Wt. PART. COLLECTED -------	0.3278	g
WATER VOL. (V1c) -------	57	Ml	METER VOLUME Vm -------	43.405	mcf
TEST TIME (MIN) -------	140	min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : Jotul TEST No. 3

MODEL: C350 DATE: 31-Jul-06

****

AVG DELTA H	-------	0.15	in H2O	AVG PRCNT CO	-------	0.56	%
AVG METER TEMP. Tm	-------	82	deg F	AVG PRCNT CO2	-------	6.20	%
AVG PPM SO2	-------	350	PPM	AVG BAL CO2/CO	-------	11.02	%

TABLE 4 ----- CALCULATIONS

CLIENT : Jotul TEST No. 3

MODEL: C350 DATE: 31-Jul-06

****

STD SAMPLE VOL. Vm(std) d) ------	41.72	dscf	STACK GAS FLOW Qsd -------	623.342	dscf/Hr
				&	
				10.39	dscf/min
VOL. WATER VAPOR Vw(s td) -----	2.683	scf	PARTICULATE CONCTRT. C s ------	0.0079	g/dscf
PRCNT MSTR Bws -------	6.04	%	PARTC.EMISS. RATE E -------	4.90	g/Hr
BURN RATE BR -------	1.40	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.53	Lb-mole/Lb
CO EMISSION RATE -------	117.33	g/Hr	PART.EMISS. RATE ------	3.50	g/Kgdry fuel
	&				
	83.93	g/Kgdry fuel			

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : Jotul TEST No. : 3

MODEL: C350 DATE: 31-Jul-06

	TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR		PROPRTN RATE VAR. AVERAGE	
	5	508.6	98		100	
	10	515.4	99			
	15	516.4	99			
	20	518.1	100			
	25	518.1	100			
	30	517.7	100			
	35	518.0	100			
	40	517.5	100			
	45	518.7	100			
	50	518.6	100			
	55	519.9	100			
	60	519.8	100			
	65	520.5	100			
	70	520.1	100			
	75	520.0	100			
	80	521.4	100			
	85	521.4	100			
	90	521.4	100			
	95	521.4	100			
	100	521.5	100			
	105	521.2	100			
	110	521.2	100			
	115	521.5	100			
	120	521.2	100			
	125	521.5	100			
	130	521.2	100			
	135	521.5	100			
	140	521.2	100			

COMPUTER INPUT DATA SHEET #1

Client: Jotul North America

Address: 55 Hutcherson Drive
Gorham, ME 04038

Phone: 1-800-797-5912 Fax: 1-207-772-0523

Run No.: 3 Date of Test: 7-31-06 Burn Rate: 1.398

Model No.: C350 ☐ min ☐ min-1.25 ☐ fan

Stove Type: ☐ Cat ☒ Non Cat ☐ Pellet ☒ 1.25-1.9 ☐ max ☐ insert

Dry Gas Meter Y Factor: .981 (0.000) (Data Sheet #2) Post Leak Rate: .014 cfm (.000) (Data Sheet #2) Time: 140 min. (000) (Data Sheet #2)

Dry Gas Meter Volume: 43.405 cf (00.000) (Data Sheet #2)

Stack Flow: 9.928 dscfm (00.000) (Data Sheet #2) Δ H: .151 in. H_2O (.000) (Data Sheet #2)

Maximum Vac.: 2.0 (0.0) (Data Sheet #2) Barometric Pressure: 30.06 in. Hg (00.00) (Data Sheet #2)

H_2O Captured: 57.0 g (00.0) (Data Sheet #3)

Front Half Catch % Of Total: 52.8 % (00.0) (Data Sheet #6) Total Particulate Catch: .3278 g (0.0000) (Data Sheet #6)

Flue Gas Moisture: 6.0487 % (00.000) (Data Sheet #7)

Particulate Emission: .1214 gr/dscf (0.0000) (Data Sheet #7)

Relative Humidity: 40.5 % RH (00.0) (Data Sheet #8) Ambient Moisture: 1.28 % H_2O (0.00) (Data Sheet #8)

Preburn Fuel Wt.: 32.8 lbs. (00.0) (Data Sheet #8) Coal Bed Wt.: 2.1 lbs. (00.0) (Data sheet #8) Test Fuel Wt.: 8.7 lbs. (00.0) (Data sheet #8)

Heat Output (EPA Default): 16857.4 BTU/hr (00,000.0) (Data Sheet #8)

Kindling Fuel % Moisture (wet): 13.917 % (00.000) (Data Sheet #10) Pretest Fuel % Moisture (wet): 16.201 % (00.000) (Data Sheet #10)

Test Fuel % Moisture (dry): 20.975 % (00.000) (Data Sheet #10 [wood stove] or #11 [pellet stove]) Test Fuel % Moisture (wet): 17.338 %

Fuel Higher Heating Value (dry): — BTU/lb. (0000) (Data Sheet #11)

Stack Static Pressure: -.052 in. H_2O (+/- .000) (Data Sheet #12)

Average Ambient Temperature: 79 °F (00) (Data Sheet #14) Stove Temperature Change: -51.4 °F (+/- 000.0) (Data Sheet #14)

Start time = 1415
End time = 1635

Meter Temp = 542

METER BOX DATA SHEET PAGE # 2

Page: 1 of _____

UNIT: Total C350 RUN: 3 DATE: 7-31-06

Meter Box: 5H Y Factor: .981

91 @ 30

Leak checks: 15 " Hg @ .011 cfm _____ " Hg @ _____ cfm

15 " Hg @ .014 cfm _____ " Hg @ _____ cfm

Inject SO^2 @ 100 cc/min. Nozzle: Probe @ 3/8 " od Initial Volume: 1,500

ROTO: PRESS: .17			SAMPLING RATIO: 33 : 1				BP: 30.08		
MIN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
0	1415	644.000	——	9.980	.15	77	350	77	1.0
5	20	645.500	——	12.678	.24	78	275	78	2.0
10	25	647.438	647.438	9.280	.13	79	375	79	1.0
15	30	648.865	648.865	9.263	.13	80	375	80	1.0
20	35	650.298	650.298	9.263	.13	80	375	80	1.0
25	40	651.731	651.731	10.688	.17	80	325	80	2.0
30	45	653.383	653.383	10.688	.17	80	325	80	2.0
35	50	655.036	655.036	10.688	.17	80	325	80	2.0
40	55	656.689	656.689	9.906	.15	81	350	81	2.0
45	1500	658.229	658.229	9.906	.15	81	350	81	2.0
50	05	659.770	659.770	10.648	.17	82	325	82	2.0
55	10	661.435	661.435	9.888	.15	82	350	82	2.0
ROTO PRESS: .17			TOTALS:	122.876	1.91	960	BP.: 30.05		
60	1515	662.981	662.981	9.878	.15	82	350	82	2.0
65	20	664.529	664.529	9.878	.15	82	350	82	2.0
70	25	666.076	666.076	9.878	.15	82	350	82	2.0
75	30	667.624	667.624	9.202	.13	83	375	83	2.0
80	35	669.074	669.074	9.202	.13	83	375	83	2.0
85	40	670.524	670.524	9.202	.13	83	375	83	2.0
90	45	671.974	671.974	9.202	.13	83	375	83	2.0
95	50	673.424	673.424	9.860	.15	83	350	83	2.0
100	55	674.978	674.978	9.860	.15	83	350	83	2.0
105	1600	676.531	676.531	9.860	.15	83	350	83	2.0
110	05	678.084	678.084	9.860	.15	83	350	83	2.0
115	10	679.638	679.638	9.860	.15	83	350	83	2.0
			TOTALS:	115.742	1.72	993	MAX VACC =		
TOTAL Cu Ft.			TOTALS:	238.618	3.63	1953	AVG. BP:		

Fan?

METER BOX DATA SHEET PAGE # 2

Page: 2 of 2

UNIT: Jotul C350 RUN: 3 DATE: 7-31-06

Meter Box: SH Y Factor: .981

Leak checks: 15 " Hg @ .011 cfm _____ " Hg @ _____ cfm

15 " Hg @ .014 cfm _____ " Hg @ _____ cfm

Inject SO^2 @ 100 cc/min. Nozzle : Probe @ 3/8 " od Initial Volume: 1.500

ROTO: PRESS: .17 SAMPLING RATIO: 33 : 1 BP: 30.05

MIN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
120	1615	681.191	681.191	9.860	.15	83	350	83	2.0
125	20	682.745	682.745	9.860	.15	83	350	83	2.0
130	25	684.298	684.298	9.860	.15	83	350	83	2.0
135	30	685.852	685.852	9.860	.15	83	350	83	2.0
140	35	687.405	687.405	9.860	.15	83	350	83	2.0
145				49.300	.75	415			
150									
155									
160									
165									
170									
175									
ROTO PRESS:			TOTALS:				BP.:		
180									
185									
190									
195									
200									
205									
210									
215									
220									
225									
230									
235						2368			
			TOTALS:	287.918	4.38	82	MAX VACC =		2.0
TOTAL Cu Ft		43,405	TOTALS:	9,928	.151	542	AVG. BP:		30.06

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PARTICULATE CATCH / MOISTURE DATA SHEET # 3

UNIT : Jotul C350 RUN : 3 DATE : 7-31-06

SCALE CHECK	LEVEL	ZEROED
INITIAL :	✓	✓
FINAL :	✓	✓

SCALE	WEIGHT
295.0 g	295.0
590.0 g	590.0
885.0 g	885.0

IMPINGER	#1	#2	#3	#4
FINAL WT	669.4	586.0	484.5	915.6
INITIAL WT	619.0	583.2	483.5	912.8
NET WT GRAMS	50.4	2.8	1.0	2.8

TOTAL CATCH : 57.0 GRAMS H_2O

FRONT HALF

FILTER #	71F	
FINAL WT g	.7750	
INITIAL WT g	.6675	
NET WT g	.1075	

BEAKER #	191
DESC.	ACETONE
FINAL WT g	104.5914
INITIAL WT g	104.5252
NET WT g	.0662
VOL. DESC. ml	90

BACK HALF

FILTER #	71B	
FINAL WT g	.3564	
INITIAL WT g	.3362	
NET WT g	.0202	

BEAKER #	192	193	194	195	
DESC.	ACETONE	METHCHLOR	H_2O	H_2O	
FINAL WT g	103.5339	102.0062	104.0170	105.4845	
INITIAL WT g	103.4595	101.9852	103.9916	105.4653	
NET WT g	.0744	.0210	.0254	.0192	.0446
VOL. DESC ml	115	75	150	125	275

FILTER TARE WEIGHTS DATA SHEET #4-1

Into Dessicator : Date : 10-27-05 Time : 9:30 By : KV

Manufacturer S & S Grade : # 25 Glass Front Size : 11 cm Lot No. : ZB921

Back Size: 8.2 cm Lot No. : B1044632

	DATE: 10-31	BY: KV	DATE: 11-1	BY: KV	DATE:	BY:
FILTER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
71 F	.6675	0942	.6675	0916	-	
72 F	.6601	0943	.6601	0917	"	
73 F	.6733	0943	.6733	0917	"	
74 F	.6686	0944	.6688	0918	"	
75 F	.6680	0944	.6680	0918	"	
76 F	.6765	0945	.6767	0919	"	
77 F	.6648	0945	.6649	0919	"	
78 F	.6664	0946	.6664	0920	"	
79 F	.6734	0947	.6733	0920	"	
80 F	.6699	0947	.6698	0921	"	
71 B	.3363	0928	.3362	0911	"	
72 B	.3385	0929	.3385	0912	"	
73 B	.3387	0930	.3388	0912	"	
74 B	.3355	0931	.3354	0913	"	
75 B	.3409	0932	.3410	0913	"	
76 B	.3402	0933	.3402	0914	"	
77 B	.3378	0934	.3378	0914	"	
78 B	.3419	0935	.3418	0915	"	
79 B	.3412	0935	.3413	0915	"	
80 B	.3400	0936	.3400	0916	"	

Checked by: C. Wudington Date: 11-2-05 Time: 1055

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH
10-31	0915	KV	63	78	45
11-1	0911	KV	64	78	45

BEAKER TARE WEIGHTS DATA SHEET #4-2

Into Dessicator: Date : 11-25-05 Time : 1015 By : Cp W.

	DATE: 11-27-05	BY: KV	DATE: 11-28-05	BY: Cp	DATE:	BY:
BEAKER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
176	105.2089	1150	105.2094	1015	✓	
177	105.0934	1151	105.0939	1016	✓	
178	104.0207	1152	104.0211	1017	✓	
179	103.9995	1153	104.0000	1018	✓	
180	104.1371	1153	104.1375	1020	✓	
181	103.8770	1154	103.8775	1021	✓	
182	103.1315	1154	103.1320	1022	✓	
183	103.8049	1155	103.8053	1023	✓	
184	104.1704	1155	104.1709	1024	✓	
185	104.6349	1156	104.6353	1025	✓	
186	106.0933	1157	106.0938	1027	✓	
187	105.5771	1157	105.5775	1029	✓	
188	104.8050	1158	104.8055	1030	✓	
189	103.2081	1158	103.2085	1031	✓	
190	103.8495	1200	103.8500	1032	✓	
191	104.5248	1200	104.5252	1034	✓	
192	103.4592	1201	103.4595	1035	✓	
193	101.9848	1201	101.9852	1036	✓	
194	103.9911	1203	103.9916	1037	✓	
195	105.4652	1206	105.4653	1038	✓	
196	104.8893	1207	104.8898	1039	✓	
197	104.9687	1207	104.9690	1040	✓	
198	104.5900	1208	104.5905	1041	✓	
199	106.2448	1209	106.2452	1044	✓	
200	104.7527	1209	104.7530	1045	✓	

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH	
11-27-05	11:45	KV	59	73	43	Checked by: KV
11-28-05	1000	Cp	58	72	42	Date: 11-30
						Time: 0955

WOODSTOVE DATA SHEET # 4-3 : CONSTANT WEIGHTS

UNIT : Jotul C350 RUN : 3 DATE : 7-31-06 Page : 1 of

Beaker #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
191	8-1	1230	Cp	104.5919	8-2	1813	Cp	104.5914	8-3	1150	Cp				
192	8-1	1230	Cp	103.5334	8-2	1814	Cp	103.5339	8-3	1151	Cp				
193	8-1	1230	Cp	102.0058	8-2	1815	Cp	102.0062	8-3	1152	Cp				
194	8-1	1230	Cp	104.0166	8-2	1816	Cp	104.0170	8-3	1153	Cp				
195	8-1	1230	Cp	105.4841	8-2	1817	Cp	105.4845	8-3	1154	Cp				

Filter #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
71F	7-31	1715	Cp	.7747	8-1	1105	Cp	.7750	8-2	1807	Cp				
71B	7-31	1715	Cp	.3583	8-1	1106	Cp	.3567	8-2	1808	Cp	.3564	8-3	1200	Cp

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	DB	%RH
1	8-1	1100	Cp	78	46
2	8-2	1800	Cp	77	49
3	8-3	1140	Cp	76	49
4					
5					

Weighing Session	Date	Time	By	DB	%RH
6					
7					
8					
9					
10					

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 6-1-2006 Through	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
100.0001	9.9999	1.0000	.0999	CP	6-1	1020	78	43
100.0002	10.0000	.9999	.0999	CP	6-2	1810	75	48
100.0002	10.0000	.9998	.1000	HJ	6-5	1300	76	45
100.0002	10.0001	1.0000	.0999	CP	6-6	0900	76	46
99.9996	10.0001	1.0000	.0998	CP	6-7	1015	76	49
100.0000	10.0002	1.0000	.0998	CP	6-12	915	77	46
99.9996	9.9999	1.0000	.0999	CP	6-13	1235	78	46
100.0003	9.9999	1.0001	.0999	CP	6-14	1230	76	49
100.0004	10.0001	1.0001	.1000	CP	6-15	0840	75	48
99.9999	10.0001	1.0002	.0998	CP	6-16	1020	77	48
99.9998	10.0001	1.0000	.0999	CP	7-29	1545	77	46
100.0000	10.0001	.9997	.0999	CP	7-30	1900	75	48
99.9997	10.0000	1.0000	.0999	CP	7-31	0830	77	42
99.9996	10.0002	1.0001	.0998	CP	8-1	1100	78	46
100.0000	10.0001	1.0000	.1000	CP	8-2	1800	77	49
99.9998	10.0001	1.0001	.0998	CP	8-3	1140	76	49
99.9998	10.0003	.9999	.0999	CP	8-4	2030	76	49
100.0000	10.0002	.9999	.0999	CP	8-5	1130	76	45

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 12-8-2005 Through 5-31-2006	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	.9999	.0998	Clp	12-8	0900	67	38
100.0001	10.0001	1.0000	.0998	Clp	12-27	1500	77	49
100.0000	10.0002	1.0000	.0999	KV	12-28	1125	70	48
100.0004	10.0003	1.0000	.1000	KV	12-29	1000	74	44
99.9999	10.0002	1.0000	.0999	KV	12-30	1030	76	42
99.9998	10.0002	1.0000	.0999	KV	12-31	1200	76	45
100.0003	10.0001	.9999	.0998	KV	1-1	1345	75	44
100.0004	10.0001	.9997	.0999	Clp	1-2	1230	77	48
100.0003	10.0000	1.0001	.0999	Clp	1-4	1430	74	44
100.0003	9.9999	1.0000	.0999	Clp	1-5	1206	74	47
100.0002	9.9999	1.0000	.0999	Clp	1-6	1000	77	49
100.0000	10.0001	.9999	.0997	KV	1-8	1000	71	41
100.0002	10.0000	1.0000	.0999	Clp	1-9	1400	75	48
100.0000	10.0001	1.0000	.0999	Clp	1-12	1200	74	47
100.0001	10.0001	.9999	.0998	Clp	1-13	1500	73	49
99.9999	10.0003	.9998	.0998	Clp	1-15	1230	69	49
100.0003	10.0001	1.0001	.1000	Clp	1-16	1415	70	48
100.0003	10.0001	.9998	.0996	KV	1-24	1015	67	46
100.0003	10.0001	1.0000	.1000	KV	1-25	920	70	44
100.0001	10.0000	1.0000	.0999	Clp	2-2	530	74	48
100.0003	10.0002	.9999	.0998	KV	2-2	0930	75	48
100.0004	10.0002	.9999	.0999	KV	2-3	0900	74	47
100.0001	10.0002	1.0000	.1000	Clp	2-4	1100	77	42
100.0002	10.0000	1.0000	.1000	KV	2-6	1202	74	44
100.0000	10.0001	1.0000	.1000	KV	2-7	1119	73	43
99.9999	10.0001	1.0001	.0999	Clp	2-8	1135	75	41
100.0002	10.0001	.9999	.0999	KV	2-10	0930	72	42
100.0000	10.0000	.9999	.0999	Clp	2-13	0940	75	46
100.0001	10.0002	1.0000	.0999	KV	2-20	1200	71	44
100.0003	10.0001	.9999	.0999	Clp	3-1	1215	78	43
100.0004	10.0001	1.0000	.0999	Clp	3-2	1515	74	49
100.0001	10.0003	1.0001	.1001	KV	3-3	1100	74	44
100.0004	10.0002	1.0000	.0998	Clp	3-6	1300	75	48
100.0002	10.0001	1.0002	.0999	Clp	3-7	1905	75	48
100.0002	9.9999	.9999	.0999	Clp	5-24	1600	78	46
100.0004	10.0001	.9999	.0999	Clp	5-25	0830	76	45
100.0000	9.9999	.9997	.0999	Clp	5-26	0840	74	47
100.0003	9.9999	1.0000	.0998	CR	5-30	1220	73	48
100.0002	10.0001	.9999	.1000	Clp	5-31	1015	78	46

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 10-21-2005 Through 12-6-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	1.0000	.0999	Clp	10-21	0900	74	44
100.0000	10.0001	1.0000	.0999	Clp	10-22	1630	78	46
99.9998	10.0000	.9998	.0998	Clp	10-23	1130	74	49
99.9996	10.0000	.9998	.0997	KV	10-24	9:00	77	52
100.0000	10.0003	1.0000	.0999	KV	10-25	9:30	76	49
99.9999	10.0001	.9999	.0997	KV	10-26	9:50	70	48
99.9998	10.0000	.9999	.0998	KV	10-27	8:25	75	47
99.9996	10.0003	1.0001	.0999	KV	10-28	10:45	68	47
99.9999	10.0001	1.0000	.1000	Clp	10-29	1900	75	44
99.9998	10.0003	1.0000	.0999	Clp	10-30	1145	72	42
99.9999	10.0000	0.9998	.0998	KV	10-31	9:00	78	44
100.0001	10.0000	0.9997	.1000	KV	11-1	0850	75	42
99.9996	9.9998	.9998	.0996	KV	11-2	0915	72	49
99.9996	10.0000	1.0000	.0998	KV	11-3	1429	73	46
99.9997	10.0000	.9999	.0999	KV	11-4	1100	72	42
100.0002	10.0000	1.0001	.1000	Clp	11-5	1015	69	44
99.9998	10.0001	1.0000	.0999	KV	11-7	0930	75	41
99.9998	10.0000	.9998	.0999	KV	11-9	1111	70	48
100.0002	10.0001	.9999	.1000	KV	11-10	1040	73	47
99.9999	10.0001	.9999	.0998	Clp	11-12	1600	67	49
100.0001	10.0000	1.0000	.0999	Clp	11-13	1430	74	47
99.9999	10.0000	1.0000	.0999	Clp	11-15	1500	72	44
100.0002	10.0000	.9999	.0999	KV	11-16	0815	70	44
100.0005	10.0000	1.0000	.0999	Clp	11-17	0930	72	46
100.0004	10.0002	1.0001	.1000	Clp	11-18	1600	72	48
100.0003	10.0001	.9999	.0999	Clp	11-20	1100	68	47
100.0004	10.0002	1.0000	.1000	Clp	11-21	1200	74	44
100.0002	10.0002	.9999	.0998	Clp	11-22	1030	74	42
99.9999	10.0000	1.0000	.0999	Clp	11-25	1000	69	47
100.0002	10.0001	.9999	.0999	KV	11-26	1330	72	47
100.0000	10.0001	.9999	.0999	KV	11-27	1145	73	43
100.0001	10.0002	1.0000	.1000	Clp	11-28	1000	72	42
100.0004	10.0000	1.0000	.0998	Clp	11-29	0940	72	42
99.9999	10.0001	1.0001	.0999	KV	11-30	0930	70	44
100.0001	10.0001	1.0000	.0998	Clp	12-1	0900	70	41
100.0000	10.0000	.9999	.1000	Clp	12-2	1340	72	42
100.0000	10.0000	.9998	.0999	Clp	12-3	1400	68	43
99.9999	9.9998	.9999	.0996	Clp	12-5	1620	71	45
99.9997	10.0001	1.0000	.0994	Clp	12-6	1430	69	44

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 07/15/05 Through 10-20-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9998	9.9994	.9999	.0998	[illegible]	07/15	2000	78	46
99.9997	9.9998	1.0000	.1000	[illegible]	07/19	2250	78	46
100.0000	9.9994	.9999	.0999	[illegible]	07/20	0740	78	46
100.0000	9.9994	1.0000	.1000	[illegible]	07/21	2100	78	46
99.9998	9.9998	.9999	.1000	[illegible]	07/24	2200	78	46
100.0001	10.0000	1.0000	.1000	[illegible]	07/27	1515	78	49
99.9998	10.0000	.9998	.1000	[illegible]	07/28	0600	78	49
99.9999	10.0001	1.0000	.1000	[illegible]	07/29	1210	78	49
100.0000	10.0000	1.0001	.0998	CW	9-6	0930	74	48
100.0000	9.9998	.9998	.0996	CW	9-7	0955	72	47
99.9999	10.0000	1.0001	.1000	CW	9-8	1010	78	43
99.9999	10.0001	.9999	.0999	CW	9-9	0945	75	48
99.9996	9.9999	1.0000	.1000	CW	9-10	1630	75	48
99.9998	9.9999	1.0000	.0999	CW	9-11	1300	75	44
99.9997	10.0000	1.0000	.0998	CW	9-12	0920	74	48
99.9998	10.0001	.9999	.0999	CW	9-13	0945	74	47
99.9996	10.0001	.9999	.0999	CW	9-14	1400	77	46
99.9997	10.0001	1.0001	.0999	CW	9-15	0815	75	48
99.9996	10.0000	1.0000	.1000	CW	9-16	0955	76	49
99.9998	10.0001	.9999	.0998	CW	9-17	1200	76	45
99.9997	9.9998	.9999	.0998	CW	9-18	1430	73	47
100.0004	10.0002	1.0000	.0998	CW	9-19	0810	74	44
100.0000	10.0000	1.0000	.1000	CW	9-20	1910	77	44
100.0000	10.0000	1.0000	.0998	CW	9-21	1620	78	46
100.0000	10.0001	1.0000	.0999	CW	9-22	1420	76	49
100.0004	10.0003	1.0000	.0997	CW	9-23	1300	72	46
99.9998	10.0001	1.0000	.0999	CW	10-1	1830	74	47
100.0000	10.0000	1.0000	.0999	CW	10-2	1830	69	47
100.0001	10.0001	.9998	.0999	CW	10-5	0840	74	47
99.9998	10.0001	1.0000	.0999	CW	10-6	0930	77	47
99.9998	10.0002	.9999	.1000	CW	10-8	1340	75	45
100.0000	10.0002	.9999	.0997	CW	10-10	1330	76	48
99.9999	10.0000	1.0001	.1000	CW	10-11	1020	77	46
99.9998	10.0002	.9999	.1000	CW	10-12	1000	74	44
100.0001	10.0001	1.0000	.0997	CW	10-13	1020	70	48
99.9999	10.0000	1.0001	.0999	CW	10-14	1000	70	48
100.0000	10.0001	.9999	.0999	CW	10-15	1440	72	46
99.9997	9.9999	1.0000	.1000	CW	10-20	1000	77	49

BLANK PROCESSING DATA SHEET # 5

UNIT : Soxtul C350 RUN : 3 DATE : 7-3-06

BLANKS DONE : 10-11-2005

BEAKER	A	B	C
	200 ml ACETONE	75 ml DICHLOR	200 ml WATER
	FISHER OPTIMA LOT # 023283	FISHER OPTIMA LOT # 035941	DWNA, Inc. Sparklettes Distilled
FINAL WEIGHT	108.9008	106.3077	106.9670
TARE WEIGHT	108.8995	106.3066	106.9645
NET WEIGHT	.0013	.0011	.0025

TARE BEAKERS INTO DESC : TIME : 1900 DATE : 10-2-2005

DATE : 10-5 BY : CP DATE : 10-6 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.8996	0912	108.8995	1001	✓	
B	106.3065	0913	106.3066	1002	✓	
C	106.9642	0914	106.9645	1003	✓	

FINAL BEAKERS INTO DESC : TIME : 1000 DATE : 10-8-05

DATE : 10-10 BY : CP DATE : 10-11 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.9010	1348	108.9008	1105	✓	
B	106.3076	1349	106.3077	1106	✓	
C	106.9675	1350	106.9670	1109	✓	

TARE QC

DATE	TIME	BY	WB	DB	%
10-5	0840	CP	✓	74	44
10-6	0930	CP	✓	77	47

FINAL QC

DATE	TIME	BY	WB	DB	%
10-10	1330	CP	✓	76	48
10-11	1020	CP	✓	77	46

NET PARTICULATE CATCH CALCULATION DATA SHEET #6

UNIT: Jotul C350 RUN: 3 DATE: 7/30/06

Blank Audit by C Charlington 10-14-2005

BLANK CALCULATIONS

Acetone :	.0013	g ÷	200	ml =	.000007	g/ml
Dicholoromethane :	.0011	g ÷	75	ml =	.000015	g/ml
Distilled Water :	.0025	g ÷	200	ml =	.000013	g/ml

FRONT HALF CATCH

FILTERS : .1075 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .1075 g

BEAKERS : .0662 (Total Catch) g - 90 (ml Acetone) (.000007 g) (Blank Value / ml Acetone) = .0656 g

TOTAL FRONT HALF CATCH : .1731 g

BACK HALF CATCH

FILTERS : .0202 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .0202 g

BEAKERS :

Acetone : .0744 (Total Catch) g - 115 (ml Acetone) (.000007 g) (Blank Value / ml Acetone) = 0736 g

Extract : .0210 (Total Catch) g - 75 (ml Dichloromethane) (.000015 g) (Blank Value / Dichloromethane) = .0199 g

Water : .0446 (Total Catch) g - 275 (ml Water) (.000013 g) (Blank Value / Water) = .0410 g

TOTAL BACK HALF CATCH : .1547 g

TOTAL CATCH : .3278 g

% FRONT HALF : 52.8 %

CALCULATIONS DATA SHEET # 7

UNIT: Jetul C350 RUN: 3 DATE: 7-31-06

1) $Vm(std) = \dfrac{(43.405\ Vm)(17.64)(.981\ mcf)\left[30.06"\ Hg + \frac{.151"\ H_2O}{13.6}\right]}{(542\ TmA)} = \dfrac{41.6733}{000.0000}$ dscf

2) $Vw(std) = (.04707)(57.0\ ml\ H_2O) = \dfrac{2.6830}{00.0000}$ scf

3) $Asw = \dfrac{(2.6830\ scf)}{(2.6830\ scf + 41.6733\ dscf)} = \dfrac{.0605}{.0000}$ Bws $\times 100 = \dfrac{6.0487}{00.0000}$ % H_2O

4) $Cs = \dfrac{(.3278\ g.)}{(41.6733\ dscf)}(15.43) = \dfrac{.1214}{0.0000}$ gr / dscf

5) Estimated g / hr $= \dfrac{(.3278\ g.)}{(41.6733\ dscf)}\left(\dfrac{9.928}{00.0000}\ dscfm\right)(60) = \dfrac{4.6856}{00.0000}$ g / hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf =	meter correction factor (Y factor) of meter box used for test	(p. 2)	(0.000 mcf)
" Hg =	average barometric pressure during test	(p. 2)	(00.00 " Hg)
" H_2O =	average delta H for test	(p. 2)	(.000 " H_2O)
TmA =	average meter temperature for test in degrees Absolute	(p. 2)	(000 TmA)
ml H_2O =	total water caught during test	(p. 3)	(000.0 ml H_2O)
g. =	total particulate catch for test	(p. 6)	(00.0000 g.)
dscfm =	average stack flow during test	(p. 2)	(00.000 dscf)

TEST DATA SHEET # 8

UNIT : Jotul C350 RUN : 3 DATE : 7-31-06

Test Chamber Air Velocity Start : Ø Stop : Ø Avg.: Ø

Wet Bulb / Dry Bulb

Pre : WB : 60 DB : 75 = 41 % RH 1.25 % H_2O

Post : WB : 62 DB : 78 = 40 % RH 1.30 % H_2O

Average : 40.5 % RH 1.28 % H_2O

Empty Stove Weight (lbs) : — w/ stack & oil seal : Wet : — Dry : 0.0

Kindling Weight (lbs) : Paper : .1 Wood : 2.2

Preburn Fuel Weight : 11.4 + 10.4 + 8.8 Total : 30.6

Kindling & Preburn Fuel Weight (wood only) (lbs) : **Total** : 32.8

Coal Bed Wt Range (lbs) : 2.1 - 1.8 **Scale** : 2.1 - 1.8

Upper : .25 x fuel weight : Always round DOWN to nearest tenth

Lower : .20 x fuel weight : Always round UP to nearest tenth **Actual Coal Bed Weight** : 2.1

Maximum Coal Bed Removal (lbs) : ((2.1 (Upper) + 1.8 (Lower)) ÷ 2) .25 = .4 (round down to nearest tenth)

Test Fuel (.75" x 1.5" x 5" spacers) = 16 pcs

Dimensions	Length in inches	No. Pcs	Weight in lbs	% of Load
2" x 4"	17.0	4	8.7	100.0
4" x 4"	—	—	—	

Test Fuel Weight : 8.7 lbs

Estimated Dry Burn Rate :

$$\frac{8.7 - (8.7 \times .17338)}{2.2046} \times \frac{60}{\frac{140}{\text{TIME}}} = 1.398 \text{ kg / hr}$$

Estimated BTU's/hr : 19,140 x $\frac{63}{100}$ x $\frac{1.398}{\text{DBR}}$ = 16857.4 BTU's/hr

EPA Default Efficiencies : Non-cat : 63 Cat : 72 Pellet : 78

105 - 1.89

WOOD STOVE OPERATING DATA PAGE #9

Unit : Jotul C350 Run : 3 Date : 7-31-06

FIRE STARTED: 1002

WARM UP AND PREBURN:

PRIMARY AIR : Set wide open for all warm-up / preburn fuel charges. Then set to 1/4" at start of preburn.

SECONDARY AIR : N/A CAT BYPASS : N/A

CHARCOAL BED PREPARATION :

Raked and leveled prior to each warm-up / preburn charge. At 1 1/2 min. prior to loading last fuel, raked and leveled. In stove 25 sec.

TEST:

DOOR wide open during loading Ø min. 35 sec.

PRIMARY AIR : Opened full for first 5 min., then set to run setting of 1/4".

SECONDARY AIR : N/A CAT BYPASS : N/A

FAN:

ON / OFF during warm-up

ON / OFF first 30 minutes of test

Fan speed set at Low

ON / OFF during preburn

ON / OFF balance of test run

WOOD DATA: KINDLING: A mix of the grades listed below:

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2x4	Manke/Tacoma	Std. or better	s. grn D fir
TEST:	2x4	Packwood	# 2 or better	s. grn D fir
	4x4	Packwood	# 2 or better	s. grn D fir

PELLET FUEL MANUFACTURER : N/A BRAND : N/A

All Grades WCLB rules:

WARM UP INFORMATION:

All pre-burn / warm up fuel pieces were either 10 or 16 inches.

1st warm up / pre-burn fuel charge (11.4 lbs.) added at 1017

2nd warm up / pre-burn fuel charge (10.4 lbs.) added at 1125

3rd warm up / pre-burn fuel charge (8.8 lbs.) added at 1215

4th warm up / pre-burn fuel charge (lbs.) added at

5th warm up / pre-burn fuel charge (lbs.) added at

TEST DATA SHEET #10

Unit : Jotul C350 Run : 3 Date : 7-31-06

Room Temperature : 68 °F Correction Factor : 0

Uncorrected Values are corrected for room temperature : Yes _____ No _____

Time Test Fuel moisture reading taken : 1235

Calibration Checks : X ✓ Y ✓ 12.0 12.2 22.0 22.0

pc #	Dimen.	Use	TOP		BOTTOM		SIDE		Average Corrected
			Uncor.	Cor.	Uncor.	Cor.	Uncor.	Cor.	
1	2"×4"×8'	K	14.5	15.5	15.5	16.5	15.5	16.5	16.167
2									
3									
4	2"×4"×8'	P	18.5	19.8	18.0	19.2	18.0	19.2	19.400
5	2"×4"×8'	P	19.0	20.3	18.0	19.2	18.0	19.2	19.567
6	2"×4"×8'	P	17.5	18.7	18.0	19.2	18.0	19.2	19.033
7	2"×4"×8'	P							58.000
8	2"×4"×8'	P							
9									
10									
11	2x4x17	T	19.0	20.3	19.0	20.3	19.0	20.3	20.300
12	"	T	19.5	20.9	19.0	20.3	19.0	20.3	20.500
13	"	T	18.0	19.2	18.5	19.8	18.0	19.2	19.400
14	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700
15									83.900
16									
17									
18									
19									
20	Spacers	T	21.5	23.1	22.0	23.7	22.5	24.1	23.633

Key for Use : K = Kindling P = Pretest Fuel T = Test Fuel

	KINDLING	PRETEST FUEL	TEST FUEL
Dry Moisture % :	16.167 %	19.333 %	20.975 %
Wet Moisture % :	13.917 %	16.201 %	17.338 %

To obtain Wet from Dry : $\frac{100 \times \%\ \text{Dry Reading}}{100 + \%\text{Dry Reading}}$ = % Moisture, Wet Basis

Acceptable Ranges : 16 - 20 % wet: 19 - 25 % dry (17.5 - 22.5 on Meter Uncor. reading) at 70°

GAS DATA SHEET #12

WEIGHT: 2.1 DATE: 7-31-06

UNIT: Jotul C350 RUN: 3 PAGE: 1 OF

TIME	SCALE	FUEL	DROP	V.	CO_2	V.	O_2	V.	CO	STATIC	SO_2PPM
0 1415	10.8	8.7	—	.171	4.3	.641	16.0	.054	.53	-.044	350
5 20	9.9	7.8	.9	.234	5.9	.577	14.4	.052	.51	-.055	275
10 25	9.4	7.3	.5	.260	6.5	.555	13.9	.046	.45	-.055	375
15 30	8.7	6.6	.7	.327	8.2	.482	12.0	.067	.66	-.059	375
20 35	8.0	5.9	.7	.379	9.5	.431	10.8	.055	.54	-.062	375
25 40	7.1	5.0	.9	.465	11.6	.359	8.9	.025	.24	-.064	325
Fan? 30 45	6.5	4.4	.6	.414	10.4	.406	10.1	.033	.32	-.064	325
35 50	5.7	3.6	.8	.445	11.1	.374	9.3	.039	.38	-.064	325
40 55	5.2	3.1	.5	.428	10.7	.387	9.7	.045	.44	-.064	350
45 1500	4.6	2.5	.6	.432	10.8	.385	9.6	.040	.39	-.064	350
50 05	4.2	2.1	.4	.337	8.4	.493	12.3	.011	.10	-.062	325
55 10	4.0	1.9	.2	.287	7.2	.538	13.4	.020	.19	-.060	350
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.717	*****
60 1515	3.7	1.6	.3	.250	6.3	.570	14.2	.030	.29	-.056	350
65 20	3.6	1.5	.1	.250	6.3	.567	14.2	.036	.35	-.055	350
70 25	3.4	1.3	.2	.250	6.3	.567	14.1	.037	.36	-.053	350
75 30	3.2	1.1	.2	.209	5.2	.601	15.0	.058	.57	-.051	375
80 35	3.1	1.0	.1	.208	5.2	.601	15.0	.059	.57	-.050	375
85 40	3.0	.9	.1	.185	4.6	.622	15.5	.067	.66	-.049	375
90 45	2.9	.8	.1	.185	4.6	.623	15.5	.068	.67	-.048	375
95 50	2.8	.7	.1	.181	4.5	.625	15.6	.071	.70	-.047	350
100 55	2.7	.6	.1	.164	4.1	.639	16.0	.076	.75	-.046	350
* 105 1600	2.6	.5	.1	.158	4.0	.644	16.1	.078	.77	-.045	350
110 05	2.5	.4	.1	.150	3.8	.649	16.2	.082	.81	-.044	350
115 10	2.5	.4	0	.145	3.4	.653	16.3	.089	.88	-.044	350
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.588	*****
120 1615	2.4	.3	.1	.139	3.5	.657	16.4	.092	.91	-.042	350
125 20	2.3	.2	.1	.138	3.5	.660	16.5	.089	.88	-.042	350
130 25	2.2	.1	.1	.134	3.4	.665	16.4	.085	.84	-.041	350
135 30	2.2	.1	0	.122	3.1	.681	17.0	.077	.76	-.040	350
140 35	2.1	0	.1	.121	3.1	.681	17.0	.079	.78	-.040	350
145										-.205	
150											
155											
160											
165											
170											
175										-1.510	
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****		*****
TOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.052	*****

PREBURN DATA SHEET #13

UNIT: Jotul C350 RUN: 3 DATE: 7-31-06 PAGE: 1 of 1

TIME	SCALE	DROP	STACK	TOP	LF SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC/CAT	AMBIENT	STATIC	COMMENTS
0/1310	3.2	—	406	741	390	562	500	718	1116	1113	89	-.062	PREBURN START: # 1.1 UP
5/15	3.2	ϕ	317	668	368	491	486	700	1043	988	85	-.055	COAL BED SCALE RANGE:
10/20	3.1	.1	279	621	365	474	476	667	1030	921	85	-.051	2.1 → 1.8
15/25	2.9	.2	263	575	363	451	464	638	1003	874	84	-.049	PRIMARY AIR: 1/4"
20/30	2.8	.1	246	525	336	413	439	591	945	832	81	-.048	SECONDARY AIR: N/A
25/35	2.8	ϕ	244	514	333	406	433	575	936	819	81	-.048	FAN: LOW
30/40	2.7	.1	241	498	335	388	424	555	924	809	80	-.048	PUMPS ON AT: 1340
35/45	2.5	.2	231	485	321	373	414	533	901	800	80	-.047	CHECK WB/DB:
40/50	2.4	.1	223	460	314	359	404	520	868	785	79	-.047	
45/55	2.3	.1	216	447	308	346	394	505	831	770	79	-.046	
50/1400	2.3	.ϕ	210	431	300	334	385	491	783	743	79	-.046	
55/05	2.3	ϕ	208	422	296	327	378	481	757	723	78	-.045	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	
10/1410	2.2	.1	264	409	288	318	370	468	734	703	78	-.044	
15/15	2.1	.1	208	412	284	311	359	452	703	630	78	-.044	

Jotul C350

Temperature Data Sheet #14

Run 3
7/31/06

Time	Stack	Top	LT Side	Back	Rt Side	Bottom	Firebox	Sec/Cat	Ambient	Tube Furn	Smpl Box	Smpl Out	C-Gas Box	C-Gas Out	SO2 Out
********	Chn 103	Chn 104	Chn 105	Chn 106	Chn 107	Chn 108	Chn 109	Chn 110	Chn 111	Chn 112	Chn 113	Chn 114	Chn 115	Chn 116	Chn 117
0	208	412	284	311	359	452	703	630	77	1434	230	59	229	35	34
5	396	431	282	348	352	456	803	746	78	1414	229	45	231	35	34
10	276	446	283	345	351	451	677	781	78	1397	229	44	234	35	34
15	296	515	276	338	344	449	669	988	78	1380	229	44	236	36	34
20	320	578	269	340	339	445	695	1104	78	1366	229	48	238	36	35
25	352	635	266	353	341	441	741	1249	77	1353	229	47	240	36	35
30	350	659	264	367	350	438	783	1259	78	1344	230	45	243	36	35
35	356	686	267	341	361	434	813	1306	78	1337	230	46	244	36	35
40	363	709	273	346	374	432	851	1246	79	1331	231	45	245	36	35
45	351	705	279	358	386	431	888	1213	80	1328	231	46	244	36	35
50	331	718	288	371	395	430	893	1101	80	1324	232	47	244	36	35
55	310	690	293	402	400	427	896	1051	81	1321	231	47	244	36	35
60	290	646	297	412	404	426	891	945	80	1319	231	47	243	36	35
65	276	621	301	418	406	425	895	914	80	1317	231	47	243	36	34
70	267	596	299	415	405	426	887	890	81	1316	232	47	244	36	34
75	252	574	299	407	403	425	861	879	80	1315	231	48	243	36	34
80	244	560	300	388	401	426	840	862	80	1315	231	49	243	37	34
85	235	514	294	371	395	422	821	804	80	1315	230	50	242	37	34
90	232	490	292	355	387	414	803	786	80	1313	229	50	242	37	34
95	226	470	293	341	383	407	791	771	80	1311	229	51	241	37	34
100	219	451	286	330	375	401	773	744	80	1310	228	51	241	37	34
105	215	433	284	321	369	396	750	715	80	1309	228	51	241	37	33
110	211	419	279	313	363	391	722	689	80	1308	228	51	240	37	33
115	208	405	274	306	355	386	705	671	80	1307	228	51	240	37	33
120	203	392	268	299	346	381	692	657	79	1307	229	51	240	36	33
125	199	379	266	295	341	375	681	644	79	1306	229	51	239	36	33
130	197	368	260	291	335	369	671	634	80	1305	229	50	239	36	33
135	193	358	256	288	329	363	644	607	79	1307	230	49	239	36	32
140	192	348	250	284	324	356	625	587	79	1308	230	49	239	36	32

TEMPERATURE DATA SHEET #14A

		TEST TIME	140		
STACK AVG	268	TOP AVG	524	LT SIDE AVG	280
BACK AVG	347	RT SIDE AVG	368	BOTTOM AVG	416
FIREBOX AVG	775	SEC/CAT AVG	878	AMBIENT AVG	79

END	312.5	
START	363.9	
	-51.4	DELTA T

CIRCLE: **LOSS** / **GAIN**

ZERO / SPAN CHECK DATA SHEET #15-1

Date : 7-31-06 Analyte : CO_2 (15-1)

Unit : Jotul C350 Run # : 3

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % CO_2 Cyl. Press. : 960 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 407069

Range : 0 - 25.0 % CO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % CO_2

EPA Control Limits = ± 2.5% of 25.0 % CO_2 = ± 0.625 % CO_2

Method 28 A = ± .2 % of 25.0 % CO_2 = ± .05 % CO_2

PRE RUN Audit : by : C. Wadlington Time : 1315 Temp : 88 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	.012	.012	.049
SPAN	50.0	.500	12.50	50.1	.501	12.522	.022	.088

POST RUN Audit : by : C. Wadlington Time : 1645 Temp : 80 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	.000	.012	.012	.049
SPAN	50.0	.500	12.50	50.2	.502	12.547	.047	.188

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-2

Date : 7-31-06 Analyte : O_2 (15-2)

Unit : Jotul C350 Run # : 3

Zero Cyl. # : 168TAC 3A Conc. : 0.00 % O_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % O_2 Cyl. Press. : 960 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : TELEDYNE Model : 320 A SN : 37400

Range : 0 - 25.0 % O_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % O_2

EPA Control Limits = ± 2.5% of 25.0 % O_2 = ± 0.625 % O_2

Method 28 A = ± .2 % of 25.0 % O_2 = ± .05 % O_2

PRE RUN Audit : by : C. Washington Time : 1315 Temp : 88 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	.015	.015	.061
SPAN	12.50	.500	1250	12.5	.500	12.471	-.029	-.115

POST RUN Audit : by : C. Washington Time : 1645 Temp : 80 °F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.002	.040	.040	.161
SPAN	12.50	.500	12.50	12.5	.501	12.496	-.004	-.016

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-3

Date : 7-31-06 Analyte : CO (15-3)

Unit : Total C350 Run # : 3

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 4.99 % CO Cyl. Press. : 960 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 408005

Range : 0 - 10.0 % CO Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 10.0 % CO

EPA Control Limits = ± 2.5% of 10.0 % CO = ± 0. 25 % CO

Method 28 A = ± .2 % of 10.0 % CO = ± .02 % CO

PRE RUN Audit : by : C. Wartington Time : 1315 Temp : 88 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	-.006	-.006	-.059
SPAN	49.9	.499	4.99	49.6	.496	4.971	-.019	-.192

POST RUN Audit : by : C. Wartington Time : 1645 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	-.006	-.006	-.059
SPAN	49.9	.499	4.99	49.9	.499	5.001	.011	.109

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-4

Date : 7-31-06 Analyte : SO_2 (15-4)

Unit : Jotul C350 Run # : 3

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 ppm SO_2 Cyl. Press. : 1150 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC62184 Conc. : 1290 ppm SO_2 Cyl. Press. : 400 PSI

Certified by : AIR LIQUIDE Date : 01-29-01

Analyzer : Make : HORIBA Model : PIR-2000 SN : 403019

Range : 0 - 2500 ppm SO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 2500 ppm SO_2

EPA Control Limits = ± 2.5% of 2500 ppm SO_2 = ± 62.5 ppm SO_2

PRE RUN Audit : by : C. Wadsworth Time : 1315 Temp : 88 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.003	.786	.786	.031
SPAN	51.6	.516	1290	51.2	.512	1279.4	-10.600	.424

POST RUN Audit : by : C. Wadsworth Time : 1645 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.001	5.752	5.752	.230
SPAN	51.6	.516	1290	51.7	.517	1291.9	1.900	.076

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

QUALITY CHECKS DATA SHEET # 16

UNIT : Jotol C350 RUN : 3 DATE : 7-31-06

Thermocouple Check:

T/C # 1	— °F	T/C # 13	65.1 °F
T/C # 2	— °F	T/C # 14	64.9 °F
T/C # 3	64.3 °F	T/C # 15	65.4 °F
T/C # 4	62.0 °F	T/C # 16	66.0 °F
T/C # 5	61.9 °F	T/C # 17	64.6 °F
T/C # 6	61.9 °F	T/C # 18	67.5 °F
T/C # 7	61.9 °F	T/C # 19	64.0 °F
T/C # 8	61.8 °F	T/C # 20	— °F
T/C # 9	61.9 °F	T/C # 21	— °F
T/C # 10	62.0 °F	T/C # 22	— °F
T/C # 11	61.8 °F	T/C # 23	— °F
T/C # 12	67.8 °F	T/C # 24	— °F

Thermocouple Readout:

Pretest zero and span check and calibration — post test zero and span — % difference

ZERO -.3 °F Adj. to 0.0 °F ZERO .4 °F Difference .020 %

SPAN 2000.3 °F Adj. to 2000.0 °F SPAN 2000.6 °F Difference .030 %

Thermocouple Readout Pretest Linearity Check:

0	= 0.0 °F	200	= 200.2 °F	400	= 400.0 °F
600	= 599.8 °F	800	= 799.7 °F	1000	= 999.8 °F
1200	= 1199.8 °F	1400	= 1399.5 °F	1600	= 1599.5 °F
1800	= 1799.8 °F	2000	= 2000.0 °F		

Sample Train Leak Check	Pre ✓	Post ✓
C-gas Train Leak Check	Pre ✓	Post ✓
SO_2 Train Leak Check	Pre ✓	Post ✓
Static Gauge Zero Check	Pre ✓	Post ✓

Scale Check Pre : 12.3 − 2.3 =

Post : 12.0 − 2.0 = 10.0

Stack Cleaned Prior to Test Run : YES ____ NO X

TABLE 1 ----- RAW DATA

CLIENT : Jotul TEST No. : 4

MODEL: C350 DATE: 01-Aug-06

TIME (MIN.)	METER READING (C F)	DELTA H (IN. H2O)	METER TEMP. (DEG. F)	PERCENT CO (%)	PERCENT CO2 (%)	SO2 COCENTR. PPM
0	688.000	0.150	78	0.60	3.80	300
5	689.500	0.170	81	0.35	14.60	275
10	691.173	0.140	83	0.20	14.60	300
15	692.719	0.140	84	0.17	15.60	300
20	694.270	0.140	85	0.23	16.80	300
25	695.827	0.140	85	0.09	14.90	300
30	697.384	0.140	85	0.05	13.30	300
35	698.941	0.140	85	0.07	10.90	300
40	700.498	0.140	85	0.18	7.40	300
45	702.055	0.140	85	0.44	5.60	300
50	703.611	0.140	85	0.51	5.30	300
55	705.168	0.140	85	0.60	4.90	300
60	706.725	0.140	85	0.60	4.50	300
65	708.282	0.140	85	0.65	4.20	300
70	709.839	0.140	85	0.65	3.80	300
75						

TABLE 2---RAW DATA

CLIENT : Jotul TEST No. 4

MODEL: C350 DATE: 01-Aug-06

METER CAL. FACTOR (Y) -------	0.981		Wt. WOOD BURNED(LB) -------	8.9	Lbs
BAROMETRIC PRESS.(Pb) -------	30.15	in Hg	WET,FUEL MOISTURE % -------	17.825	%
LEAK RATE POST (Lp) -------	0.001	cfm	Wt. PART. COLLECTED -------	0.0713	g
WATER VOL. (V1c) -------	40.2	Ml	METER VOLUME Vm -------	21.839	mcf
TEST TIME (MIN) -------	70	min	HC MOLE FRACTION -------	0.0132	

TABLE 3 -----FIELD DATA AVERAGES

CLIENT : Jotul TEST No. 4

MODEL: C350 DATE: 01-Aug-06

****

AVG DELTA H	-------	0.14	in H2O	AVG PRCNT CO	-------	0.36	%
AVG METER TEMP. Tm	-------	84	deg F	AVG PRCNT CO2	-------	9.35	%
AVG PPM SO2	-------	298	PPM	AVG BAL CO2/CO	-------	26.01	%

TABLE 4 ----- CALCULATIONS

CLIENT : Jotul TEST No. 4

MODEL: C350 DATE: 01-Aug-06

****

STD SAMPLE VOL. Vm(std) d) ------	20.96	dscf	STACK GAS FLOW Qsd -------	928.785 & 15.48	dscf/Hr & dscf/min
VOL. WATER VAPOR Vw(s td) -----	1.892	scf	PARTICULATE CONCTRT. C s ------	0.0034	g/dscf
PRCNT MSTR Bws -------	8.28	%	PARTC.EMISS. RATE E -------	3.16	g/Hr
BURN RATE BR -------	2.84	Kg/Hr	MOLES OF GAS PER Lb WOOD Nt ----	0.39	Lb-mole/Lb
CO EMISSION RATE -------	111.76 & 39.31	g/Hr & g/Kgdry fuel	PART.EMISS. RATE ------	1.11	g/Kgdry fuel

TABLE 5 ----- PROPORTIONAL RATE VARIATION

CLIENT : Jotul TEST No. : 4

MODEL: C350 DATE: 01-Aug-06

TIME INTEVAL Ti	PPM * Vm	PROPRTN. RATE VAR. PR	PROPRTN RATE VAR. AVERAGE
5	435.6	98	100
10	443.3	99	
15	445.6	100	
20	446.3	100	
25	447.6	100	
30	447.6	100	
35	447.6	100	
40	447.6	100	
45	447.6	100	
50	447.3	100	
55	447.6	100	
60	447.6	100	
65	447.6	100	
70	447.6	100	
75			

COMPUTER INPUT DATA SHEET #1

Client: Jotul North America

Address: 55 Hutcherson Drive
Gorham, ME 04038

Phone: 1-800-797-5912 Fax: 1-207-772-0523

Run No.: 4 Date of Test: 8-1-06 Burn Rate: 2.843

Model No.: C350 ☐ min ☐ min-1.25 ☐ fan

Stove Type: ☐ Cat ☒ Non Cat ☐ Pellet ☐ 1.25-1.9 ☒ max ☐ insert

Dry Gas Meter Y Factor: .981 (0.000) (Data Sheet #2) Post Leak Rate: .001 cfm (.000) (Data Sheet #2) Time: 70 min. (000) (Data Sheet #2)

Dry Gas Meter Volume: 21.839 cf (00.000) (Data Sheet #2)

Stack Flow: 11.589 dscfm (00.000) (Data Sheet #2) Δ H: .143 in. H_2O (.000) (Data Sheet #2)

Maximum Vac.: 2.0 (0.0) (Data Sheet #2) Barometric Pressure: 30.15 in. Hg (00.00) (Data Sheet #2)

H_2O Captured: 40.2 g (00.0) (Data Sheet #3)

Front Half Catch % Of Total: 55.1 % (00.0) (Data Sheet #6) Total Particulate Catch: .0713 g (0.0000) (Data Sheet #6)

Flue Gas Moisture: 8.2828 % (00.000) (Data Sheet #7)

Particulate Emission: .0525 gr/dscf (0.0000) (Data Sheet #7)

Relative Humidity: 46 % RH (00.0) (Data Sheet #8) Ambient Moisture: 1.5 % H_2O (0.00) (Data Sheet #8)

Preburn Fuel Wt.: 32.7 lbs. (00.0) (Data Sheet #8) Coal Bed Wt.: 2.2 lbs. (00.0) (Data sheet #8) Test Fuel Wt.: 8.9 lbs. (00.0) (Data sheet #8)

Heat Output (EPA Default): 34281.5 BTU/hr (00,000.0) (Data Sheet #8)

Kindling Fuel % Moisture (wet): 11.739 % (00.000) (Data Sheet #10) Pretest Fuel % Moisture (wet): 17.188 % (00.000) (Data Sheet #10)

Test Fuel % Moisture (dry): 21.692 % Test Fuel % Moisture (wet): 17.825 %
(00.000) (Data Sheet #10 [wood stove] or #11 [pellet stove])

Fuel Higher Heating Value (dry): — BTU/lb. (0000) (Data Sheet #11)

Stack Static Pressure: -.066 in. H_2O (+/- .000) (Data Sheet #12)

Average Ambient Temperature: 84 °F (00) (Data Sheet #14) Stove Temperature Change: 35.5 °F (+/- 000.0) (Data Sheet #14)

Start time = 1430
End time = 1540

Meter Temp = 544

METER BOX DATA SHEET PAGE # 2

Page: 1 of 1

UNIT: Jotul C350 RUN: 4 DATE: 8-1-06

Meter Box: SH Y Factor: .981

Leak checks: 15 " Hg @ .004 cfm _____ " Hg @ _____ cfm

48 @ 12 15 " Hg @ .001 cfm _____ " Hg @ _____ cfm

Inject SO^2 @ 100 cc/min. Nozzle: Probe @ 3/8 " od Initial Volume: 1,500

ROTO: PRESS: .17 SAMPLING RATIO: 34 : 1 BP: 30.15

MIN	TIME	METER READING	SAMPLE MDCF	STACK DSCFM	DELTA H	METER TEMP	SO2 PPM	ROTO TEMP	PUMP VACC
0	1430	688.000	——	11.648	.15	78	300	78	2.0
5	35	689.500	——	12.637	.17	81	275	81	2.0
10	40	691.173	691.173	11.541	.14	83	300	83	2.0
15	45	692.719	692.719	11.520	.14	84	300	84	2.0
20	50	694.270	694.270	11.499	.14	85	300	85	2.0
25	55	695.827	695.827	11.499	.14	85	300	85	2.0
30 Fan?	1500	697.384	697.384	11.499	.14	85	300	85	2.0
35	05	698.941	698.941	11.499	.14	85	300	85	2.0
40	10	700.498	700.498	11.499	.14	85	300	85	2.0
45	15	702.055	702.055	11.499	.14	85	300	85	2.0
50	20	703.611	703.611	11.499	.14	85	300	85	2.0
55	25	705.168	705.168	11.499	.14	85	300	85	2.0
ROTO PRESS:		.17	TOTALS:	139.338	1.72	1006	BP.:	30.15	
60	1530	706.725	706.725	11.499	.14	85	300	85	2.0
65	35	708.282	708.282	11.499	.14	85	300	85	2.0
70	40	709.834	709.839	11.499	.14	85	300	85	2.0
75				34.497	.42	255			
80									
85									
90									
95									
100									
105									
110						1261			
115				173.835	2.14				
			TOTALS:			84	MAX VACC =		2.0
TOTAL Cu Ft.		21.839	TOTALS:	11.589	.143	544	AVG. BP:	30.15	

PARTICULATE CATCH / MOISTURE DATA SHEET # 3

UNIT : Jotul C350 RUN : 4 DATE : 8-1-06

SCALE CHECK	LEVEL	ZEROED
INITIAL :	✓	✓
FINAL :	✓	✓

SCALE	WEIGHT
295.0 g	295.0
590.0 g	590.0
885.0 g	885.0

IMPINGER	#1	#2	#3	#4
FINAL WT	665.9	592.6	484.0	917.4
INITIAL WT	629.8	591.4	483.6	915.1
NET WT GRAMS	36.1	1.2	.4	2.5

TOTAL CATCH : 40.2 GRAMS H_2O

FRONT HALF

FILTER #	72F	
FINAL WT g	.6860	
INITIAL WT g	.6601	
NET WT g	.0259	

BEAKER #	196
DESC.	ACETONE
FINAL WT g	104.9038
INITIAL WT g	104.8898
NET WT g	.0140
VOL. DESC. ml	80

BACK HALF

FILTER #	72B	
FINAL WT g	.3417	
INITIAL WT g	.3385	
NET WT g	.0032	

BEAKER #	197	198	199	200	
DESC.	ACETONE	METHCHLOR	H_2O	H_2O	
FINAL WT g	104.9895	104.5954	106.2492	104.7576	
INITIAL WT g	104.9690	104.5905	106.2452	104.7530	
NET WT g	.0205	.0049	.0040	.0046	.0086
VOL. DESC ml	75	75	125	150	(275)

FILTER TARE WEIGHTS DATA SHEET #4-1

Into Dessicator : Date : 10-27-05 Time : 9:30 By : KV

Manufacturer S & S Grade : # 25 Glass Front Size : 11 cm Lot No. : ZB921

Back Size: 8.2 cm Lot No. : B1044632

	DATE: 10-31	BY: KV	DATE: 11-1	BY: KV	DATE:	BY:
FILTER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
71 F	.6675	0942	.6675	0916	"	
72 F	.6601	0943	.6601	0917	"	
73 F	.6733	0943	.6733	0917	"	
74 F	.6686	0944	.6688	0918	"	
75 F	.6680	0944	.6680	0918	"	
76 F	.6765	0945	.6767	0919	"	
77 F	.6648	0945	.6649	0919	"	
78 F	.6664	0946	.6664	0920	"	
79 F	.6734	0947	.6733	0920	"	
80 F	.6699	0947	.6698	0921	"	
71 B	.3363	0928	.3362	0911	"	
72 B	.3385	0929	.3385	0912	"	
73 B	.3387	0930	.3388	0912	"	
74 B	.3355	0931	.3354	0913	"	
75 B	.3409	0932	.3410	0913	"	
76 B	.3402	0933	.3402	0914	"	
77 B	.3378	0934	.3378	0914	"	
78 B	.3419	0935	.3418	0915	"	
79 B	.3412	0935	.3413	0915	"	
80 B	.3400	0936	.3400	0916	"	

Checked by: C. Wudington Date: 11-2-05 Time: 1055

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH
10-31	0915	KV	63	78	45
11-1	0911	KV	64	78	45

BEAKER TARE WEIGHTS DATA SHEET #4-2

Into Dessicator: Date : 11-25-05 Time : 1015 By : Cp W.

	DATE: 11-27-05	BY: KV	DATE: 11-28-05	BY: Cp	DATE:	BY:
BEAKER #	FIRST WEIGHT	TIME	SECOND WEIGHT	TIME	THIRD WEIGHT	TIME
176	105.2089	1150	105.2094	1015	✓	
177	105.0934	1151	105.0939	1016	✓	
178	104.0207	1152	104.0211	1017	✓	
179	103.9995	1153	104.0000	1018	✓	
180	104.1371	1153	104.1375	1020	✓	
181	103.8770	1154	103.8775	1021	✓	
182	103.1315	1154	103.1320	1022	✓	
183	103.8049	1155	103.8053	1023	✓	
184	104.1704	1155	104.1709	1024	✓	
185	104.6349	1156	104.6353	1025	✓	
186	106.0933	1157	106.0938	1027	✓	
187	105.5771	1157	105.5775	1029	✓	
188	104.8050	1158	104.8055	1030	✓	
189	103.2081	1158	103.2085	1031	✓	
190	103.8495	1200	103.8500	1032	✓	
191	104.5248	1200	104.5252	1034	✓	
192	103.4592	1201	103.4595	1035	✓	
193	101.9848	1201	101.9852	1036	✓	
194	103.9911	1203	103.9916	1037	✓	
195	105.4652	1206	105.4653	1038	✓	
196	104.8893	1207	104.8898	1039	✓	
197	104.9687	1207	104.9690	1040	✓	
198	104.5900	1208	104.5905	1041	✓	
199	106.2448	1209	106.2452	1044	✓	
200	104.7527	1209	104.7530	1045	✓	

BALANCE ROOM ENVIRONMENTAL CONDITIONS

DATE	TIME	BY	WB	DB	% RH	
11-27-05	11:45	KV	59	73	43	Checked by : KV
11-28-05	1000	Cp	58	72	42	Date : 11-30
						Time : 0955

WOODSTOVE DATA SHEET # 4-3 : CONSTANT WEIGHTS

UNIT : Jotul C350 RUN : 4 DATE : 8-1-16 Page : 1 of

Beaker #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
196	8-2	1830	CP	104.9043	8-4	2035	CP	104.9038	8-5	1133	CP				
197	8-2	1830	CP	104.9899	8-4	2036	CP	104.9895	8-5	1134	CP				
198	8-2	1830	CP	104.5958	8-4	2037	CP	104.5954	8-5	1135	CP				
199	8-2	1830	CP	106.2495	8-4	2038	CP	106.2492	8-5	1136	CP				
200	8-2	1830	CP	104.7581	8-4	2039	CP	104.7576	8-5	1137	CP				

Filter #	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By	Weight	Date	Time	By
72F	8-1	1700	CP	.6862	8-2	1810	CP	.6860	8-3	1143	CP				
723	8-1	1700	CP	.3419	8-2	1811	CP	.3417	8-3	1144	CP				

SCALE ROOM ENVIRONMENTAL CONDITIONS

Weighing Session	Date	Time	By	DB	%RH
1	8-2	1800	CP	77	49
2	8-3	1140	CP	76	49
3	8-4	2030	CP	76	49
4	8-5	1130	CP	76	45
5					

Weighing Session	Date	Time	By	DB	%RH
6					
7					
8					
9					
10					

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 6-1-2006 Through	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
100.0001	9.9999	1.0000	.0999	CP	6-1	1020	78	43
100.0002	10.0000	.9999	.0999	CP	6-2	1810	75	48
100.0002	10.0000	.9998	.1000	HV	6-5	1300	76	45
100.0002	10.0001	1.0000	.0999	CP	6-6	0900	76	46
99.9996	10.0001	1.0000	.0998	CP	6-7	1015	76	49
100.0000	10.0002	1.0000	.0998	CP	6-12	915	77	46
99.9996	9.9999	1.0000	.0999	CP	6-13	1235	78	46
100.0003	9.9999	1.0001	.0999	CP	6-14	1230	76	49
100.0004	10.0001	1.0001	.1000	CP	6-15	0840	75	48
99.9999	10.0001	1.0002	.0998	CP	6-16	1020	77	48
99.9998	10.0001	1.0000	.0999	CP	7-29	1545	77	46
100.0000	10.0001	.9997	.0999	CP	7-30	1900	75	48
99.9997	10.0000	1.0000	.0999	CP	7-31	0830	77	42
99.9996	10.0002	1.0001	.0998	CP	8-1	1100	78	46
100.0000	10.0001	1.0000	.1000	CP	8-2	1800	77	49
99.9998	10.0001	1.0001	.0998	CP	8-3	1140	76	49
99.9998	10.0003	.9999	.0999	CP	8-4	2030	76	49
100.0000	10.0002	.9999	.0999	CP	8-5	1130	76	45

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 12-8-2005 Through 5-31-2006	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	.9999	.0998	Clp	12-8	0900	67	38
100.0001	10.0001	1.0000	.0998	Clp	12-27	1500	77	49
100.0000	10.0002	1.0000	.0999	KV	12-28	1125	70	48
100.0004	10.0003	1.0000	.1000	KV	12-29	1000	74	44
99.9999	10.0002	1.0006	.0999	KV	12-30	1030	76	42
99.9998	10.0002	1.0000	.0999	KV	12-31	1200	76	45
100.0003	10.0001	.9999	.0998	KV	1-1	1345	75	44
100.0004	10.0001	.9997	.0999	Clp	1-2	1230	77	48
100.0003	10.0000	1.0001	.0999	Clp	1-4	1430	74	44
100.0003	9.9999	1.0000	.0999	Clp	1-5	1206	74	47
100.0002	9.9999	1.0000	.0999	Clp	1-6	1000	77	49
100.0000	10.0001	.9999	.0997	KV	1-8	1000	71	41
100.0002	10.0000	1.0000	.0999	Clp	1-9	1400	75	48
100.0000	10.0001	1.0000	.0999	Clp	1-12	1200	74	47
100.0001	10.0001	.9999	.0998	Clp	1-13	1500	73	49
99.9999	10.0003	.9998	.0998	Clp	1-15	1230	69	49
100.0003	10.0001	1.0001	.1000	Clp	1-16	1416	70	48
100.0003	10.0001	.9998	.0996	KV	1-24	1015	67	46
100.0003	10.0001	1.0000	.1000	KV	1-25	920	70	44
100.0001	10.0000	1.0000	.0999	Clp	2-2	530	74	48
100.0003	10.0002	.9999	.0998	KV	2-2	0930	75	48
100.0004	10.0002	.9999	.0999	KV	2-3	0900	74	47
100.0001	10.0002	1.0000	.1000	Clp	2-4	1100	77	42
100.0002	10.0000	1.0000	.1000	KV	2-6	1202	74	44
100.0000	10.0001	1.0000	.1000	KV	2-7	1119	73	43
99.9999	10.0001	1.0001	.0999	Clp	2-8	1135	75	41
100.0002	10.0001	.9999	.0999	KV	2-10	0930	72	42
100.0000	10.0006	.9999	.0999	Clp	2-13	0940	75	46
100.0001	10.0002	1.0000	.0999	KV	2-20	1200	71	44
100.0003	10.0001	.9999	.0999	Clp	3-1	1215	78	43
100.0004	10.0001	1.0000	.0999	Clp	3-2	1515	74	49
100.0001	10.0003	1.0001	.1001	KV	3-3	1100	74	44
100.0004	10.0002	1.0000	.0998	Clp	3-6	1300	75	48
100.0002	10.0001	1.0002	.0999	Clp	3-7	1905	75	48
100.0002	9.9999	.9999	.0999	Clp	5-24	1600	78	46
100.0004	10.0001	.9999	.0999	Clp	5-25	0830	76	45
100.0000	9.9999	.9997	.0999	Clp	5-26	0840	74	47
100.0003	9.9999	1.0000	.0998	Clp	5-30	1220	73	48
100.0002	10.0001	.9999	.1000	Clp	5-31	1015	78	46

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 10-21-2005 Through 12-6-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9996	9.9998	1.0000	.0999	Clp	10-21	0900	74	44
100.0000	10.0001	1.0000	.0999	Clp	10-22	1130	78	46
99.9998	10.0000	.9998	.0998	Clp	10-23	1130	74	49
99.9996	10.0000	.9998	.0997	KV	10-24	9:00	77	52
100.0000	10.0003	1.0000	.0999	KV	10-25	9:30	76	49
99.9999	10.0001	.9999	.0997	KV	10-26	9:50	70	48
99.9998	10.0000	.9999	.0998	KV	10-27	8:25	75	47
99.9996	10.0003	1.0001	.0999	KV	10-28	10:45	68	47
99.9999	10.0001	1.0000	.1000	Clp	10-29	1900	75	44
99.9998	10.0003	1.0000	.0999	Clp	10-30	1145	72	42
99.9999	10.0000	0.9998	.0998	KV	10-31	9:00	78	44
100.0001	10.0000	0.9997	.1000	KV	11-1	0850	75	42
99.9996	9.9998	.9998	.0996	KV	11-2	0915	72	49
99.9996	10.0000	1.0000	.0998	KV	11-3	1429	73	46
99.9997	10.0000	.9999	.0999	KV	11-4	1100	72	42
100.0002	10.0000	1.0001	.1000	Clp	11-5	1015	69	44
99.9998	10.0001	1.0000	.0999	KV	11-7	0930	75	41
99.9998	10.0000	.9998	.0999	KV	11-9	1111	70	48
100.0002	10.0001	.9999	.1000	KV	11-10	1040	73	47
99.9999	10.0001	.9999	.0998	Clp	11-12	1600	67	49
100.0001	10.0000	1.0000	.0999	Clp	11-13	1430	74	47
99.9999	10.0000	1.0000	.0999	Clp	11-15	1500	72	44
100.0002	10.0000	.9999	.0999	KV	11-16	0815	70	44
100.0005	10.0000	1.0000	.0999	Clp	11-17	0930	72	46
100.0004	10.0002	1.0001	.1000	Clp	11-18	1600	72	48
100.0003	10.0001	.9999	.0999	Clp	11-20	1100	68	47
100.0004	10.0002	1.0000	.1000	Clp	11-21	1200	74	44
100.0002	10.0002	.9999	.0998	Clp	11-22	1030	74	42
99.9999	10.0000	1.0000	.0999	Clp	11-25	1000	69	47
100.0002	10.0001	.9999	.0999	KV	11-26	1330	72	47
100.0000	10.0001	.9999	.0999	KV	11-27	1145	73	43
100.0001	10.0002	1.0000	.1000	Clp	11-28	1000	72	42
100.0004	10.0000	1.0000	.0998	Clp	11-29	0940	72	42
99.9999	10.0001	1.0001	.0999	KV	11-30	0930	70	44
100.0001	10.0001	1.0000	.0998	Clp	12-1	0900	70	41
100.0000	10.0000	.9999	.1000	Clp	12-2	1340	72	42
100.0000	10.0000	.9998	.0999	Clp	12-3	1400	68	43
99.9999	9.9998	.9999	.0996	Clp	12-5	1620	71	45
99.9997	10.0001	1.0000	.0994	Clp	12-6	1430	69	44

WOODSTOVE DATA SHEET #4-4

SCALE QA SHEET

Dates: From 07/15/05 Through 10-20-2005	Scale: Sartorius	Model: A 120 S	SN: 37010004

100 g weight	10 g weight	1 g weight	100 mg weight	Tech	Date	Time	Dry Bulb	% RH
99.9998	9.9994	.9999	.0998	[illegible]	07/15	2000	78	46
99.9997	9.9998	1.0000	.1000	[illegible]	07/19	2250	78	46
100.0000	9.9999	.9999	.0999	[illegible]	07/20	0740	78	46
100.0000	9.9999	1.0000	.1000	[illegible]	07/21	2100	78	46
99.9998	9.9998	.9999	.1000	[illegible]	07/24	2200	78	46
100.0001	10.0000	1.0000	.1000	[illegible]	07/27	1515	78	49
99.9998	10.0000	.9998	.1000	[illegible]	07/28	0600	78	49
99.9999	10.0001	1.0000	.1000	[illegible]	07/29	1210	78	49
100.0000	10.0000	1.0001	.0998	CW	9-6	0930	74	48
100.0000	9.9998	.9998	.0996	CW	9-7	0955	72	47
99.9999	10.0000	1.0001	.1000	CW	9-8	1010	78	43
99.9999	10.0001	.9999	.0999	CW	9-9	0945	75	48
99.9996	9.9999	1.0000	.1000	CW	9-10	1630	75	48
99.9998	9.9999	1.0000	.0999	CW	9-11	1300	75	44
99.9997	10.0000	1.0000	.0998	CW	9-12	0920	74	48
99.9998	10.0001	.9999	.0999	CW	9-13	0945	74	47
99.9996	10.0001	.9999	.0999	CW	9-14	1400	77	46
99.9997	10.0001	1.0001	.0999	CW	9-15	0815	75	48
99.9996	10.0000	1.0000	.1000	CW	9-16	0955	76	49
99.9998	10.0001	.9999	.0998	CW	9-17	1200	76	45
99.9997	9.9998	.9999	.0998	CW	9-18	1430	73	47
100.0004	10.0002	1.0000	.0998	CW	9-19	0810	74	44
100.0000	10.0000	1.0000	.1000	CW	9-20	1910	77	44
100.0000	10.0000	1.0000	.0998	CW	9-21	1620	78	46
100.0000	10.0001	1.0000	.0999	CW	9-22	1420	76	49
100.0004	10.0003	1.0000	.0997	CW	9-23	1300	72	46
99.9998	10.0001	1.0000	.0999	CW	10-1	1830	74	47
100.0000	10.0000	1.0000	.0999	CW	10-2	1830	69	47
100.0001	10.0001	.9998	.0999	CW	10-5	0840	74	47
99.9998	10.0001	1.0000	.0999	CW	10-6	0930	77	47
99.9998	10.0002	.9999	.1000	CW	10-8	1340	75	45
100.0000	10.0002	.9999	.0997	CW	10-10	1330	76	48
99.9999	10.0000	1.0001	.1000	CW	10-11	1020	77	46
99.9998	10.0002	.9999	.1000	CW	10-12	1000	74	44
100.0001	10.0001	1.0000	.0997	CW	10-13	1020	70	48
99.9999	10.0000	1.0001	.0999	CW	10-14	1000	70	48
100.0000	10.0001	.9999	.0999	CW	10-15	1440	72	46
99.9997	9.9999	1.0000	.1000	CW	10-20	1000	77	49

BLANK PROCESSING DATA SHEET # 5

UNIT : Total C350 RUN : 4 DATE : 8-1-05

BLANKS DONE : 10-11-2005

BEAKER	A	B	C
	200 ml ACETONE	75 ml DICHLOR	200 ml WATER
	FISHER OPTIMA LOT # 023283	FISHER OPTIMA LOT # 035941	DWNA, Inc Sparklettes Distilled
FINAL WEIGHT	108.9008	106.3077	106.9670
TARE WEIGHT	108.8995	106.3066	106.9645
NET WEIGHT	.0013	.0011	.0025

TARE BEAKERS INTO DESC : TIME : 1900 DATE : 10-2-2005

DATE : 10-5 BY : CP DATE : 10-6 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.8996	0912	108.8995	1001	✓	
B	106.3065	0913	106.3066	1002	✓	
C	106.9642	0914	106.9645	x003	✓	

FINAL BEAKERS INTO DESC : TIME : 1000 DATE : 10-8-05

DATE : 10-10 BY : CP DATE : 10-11 BY : CP DATE : BY :

BEAKER	1 ST WT	TIME	2 ND WT	TIME	3 RD WT	TIME
A	108.9010	1348	108.9008	1105	✓	
B	106.3076	1349	106.3077	1106	✓	
C	106.9675	1350	106.9670	1109	✓	

TARE QC

DATE	TIME	BY	WB	DB	%
10-5	0840	CP	S	74	44
10-6	0930	CP		77	47

FINAL QC

DATE	TIME	BY	WB	DB	%
10-10	1330	CP	S	76	48
10-11	1020	CP		77	46

NET PARTICULATE CATCH CALCULATION DATA SHEET #6

UNIT: Jotul C350 RUN: 4 DATE: 8-1-06

Blank Audit by C Wachtyla 10-14-2005

BLANK CALCULATIONS

Acetone :	.0013	g ÷	200	ml =	.000007	g/ml
Dicholoromethane :	.0011	g ÷	75	ml =	.000015	g/ml
Distilled Water :	.0025	g ÷	200	ml =	.000013	g/ml

FRONT HALF CATCH

FILTERS : .0259 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .0259 g

BEAKERS : .0140 (Total Catch) g - 80 (ml Acetone) (.000007 .0004 g) (Blank Value / ml Acetone) = .0134 g

TOTAL FRONT HALF CATCH : .0393 g

BACK HALF CATCH

FILTERS : .0032 (Total Catch) g - 1 (# of Filters) (.0000 g) (Blank Value / Filter) = .0032 g

BEAKERS :

Acetone : .0205 (Total Catch) g - 75 (ml Acetone) (.000007 .0005 g) (Blank Value / ml Acetone) = .0200 g

Extract : .0049 (Total Catch) g - 75 (ml Dichloromethane) (.000015 .0011 g) (Blank Value / Dichloromethane) = .0038 g

Water : .0086 (Total Catch) g - 275 (ml Water) (.000013 .0036 g) (Blank Value / Water) = .0050 g

TOTAL BACK HALF CATCH : .0320 g

TOTAL CATCH : .0713 g

% FRONT HALF : 55.1 %

CALCULATIONS DATA SHEET # 7

UNIT : Jotul C350 RUN : 4 DATE : 8 - 1 - 06

1) $Vm(std) = \dfrac{(21.839\ Vm)(17.64)(.981\ mcf)\left(30.15\ "Hg + \frac{.143\ H_2O}{13.6}\right)}{(544\ TmA)} = \dfrac{20.9527}{000.0000}$ dscf

2) $Vw(std) = (.04707)(40.2\ ml\ H_2O) = \dfrac{1.8922}{00.0000}$ scf

3) $Asw = \dfrac{(1.8922\ scf)}{(1.8922\ scf + 20.9527\ dscf)} = \dfrac{.0828}{.0000}$ Bws × 100 = $\dfrac{8.2828}{00.0000}$ % H_2O

4) $Cs = \dfrac{(.0713\ g.)}{(20.9527\ dscf)}(15.43) = \dfrac{.0525}{0.0000}$ gr / dscf

5) Estimated g / hr = $\dfrac{(.0713\ g.)}{(20.9527\ dscf)}\left(\dfrac{11.589}{00.0000}\ dscfm\right)(60) = \dfrac{2,3662}{00.0000}$ g / hr

Vm =	total cubic feet pulled on meter box during test	(p. 2)	(000.000 Vm)
mcf =	meter correction factor (Y factor) of meter box used for test	(p. 2)	(0.000 mcf)
" Hg =	average barometric pressure during test	(p. 2)	(00.00 " Hg)
" H_2O =	average delta H for test	(p. 2)	(.000 " H_2O)
TmA =	average meter temperature for test in degrees Absolute	(p. 2)	(000 TmA)
ml H_2O =	total water caught during test	(p. 3)	(000.0 ml H_2O)
g. =	total particulate catch for test	(p. 6)	(00.0000 g.)
dscfm =	average stack flow during test	(p. 2)	(00.000 dscf)

TEST DATA SHEET # 8

UNIT : Jotul C350 RUN : 4 DATE : 8 - 1 - 06

Test Chamber Air Velocity Start : Ø Stop : Ø Avg.: Ø

Wet Bulb / Dry Bulb

Pre : WB : 64 DB : 76 = 51 % RH 1.6 % H_2O

Post : WB : 64 DB : 80 = 41 % RH 1.4 % H_2O

Average : 46 % RH 1.5 % H_2O

Empty Stove Weight (lbs) : — w/ stack & oil seal : Wet : — Dry : 0.0

Kindling Weight (lbs) : Paper : .1 Wood : 1.9

Preburn Fuel Weight : 12.2 + 9.7 + 8.9 Total : 30.8

Kindling & Preburn Fuel Weight (wood only) (lbs) : **Total** : 32.7

Coal Bed Wt Range (lbs) : 2.2 - 1.8 **Scale** : 2.2 - 1.8

Upper : .25 x fuel weight : Always round DOWN to nearest tenth

Lower : .20 x fuel weight : Always round UP to nearest tenth **Actual Coal Bed Weight** : 2.2

Maximum Coal Bed Removal (lbs) : ((2.2 (Upper) + 1.8 (Lower)) ÷ 2) .25 = .5 (round down to nearest tenth)

Test Fuel (.75" x 1.5" x 5" spacers) = 16 pcs

Dimensions	Length in inches	No. Pcs	Weight in lbs	% of Load
2" x 4"	17.0	4	8.9	100.0
4" x 4"	—	—	—	—

Test Fuel Weight : 8.9 lbs

Estimated Dry Burn Rate :

$$\frac{8.9 - (8.9 \times .17825)}{2.2046} \times \frac{60}{\frac{70}{\text{TIME}}} = 2.843 \text{ kg / hr}$$

Estimated BTU's/hr : 19,140 x $\frac{63}{100}$ x $\frac{2.843}{\text{DBR}}$ = 34291.5 BTU's/hr

EPA Default Efficiencies : (Non-cat : 63) Cat : 72 Pellet : 78

WOOD STOVE OPERATING DATA PAGE #9

Unit : Jotul C350 Run : 41 Date : 8-1-06

FIRE STARTED: 1030

WARM UP AND PREBURN:

PRIMARY AIR : Set wide open for all warm-up / preburn fuel charges. Then set to wide open at start of preburn.

SECONDARY AIR : N/A CAT BYPASS : N/A

CHARCOAL BED PREPARATION :

Raked and leveled prior to each warm-up / preburn charge. At 1 ½ min. prior to loading last fuel, raked and leveled. In stove 25 sec.

TEST:

DOOR wide open during loading Ø min. 40 sec.

PRIMARY AIR : Opened full for first 5 min., then set to run setting of wide open

SECONDARY AIR : N/A CAT BYPASS : N/A

FAN:

ON / OFF during warm-up

ON / OFF first ALL minutes of test

Fan speed set at High

ON / OFF during preburn

ON / OFF balance of test run

WOOD DATA: KINDLING: A mix of the grades listed below:

	SIZE	MILL	GRADE	SPECIES
PREBURN:	2x4	Manke/Tacoma	Std. or better	s. grn D fir
TEST:	2x4	Packwood	# 2 or better	s. grn D fir
	4x4	Packwood	# 2 or better	s. grn D fir

PELLET FUEL MANUFACTURER : N/A BRAND : N/A

All Grades WCLB rules:

WARM UP INFORMATION:

All pre-burn / warm up fuel pieces were either 10 or 16 inches.

1st warm up / pre-burn fuel charge (12.2 lbs.) added at 1045

2nd warm up / pre-burn fuel charge (9.7 lbs.) added at 1147

3rd warm up / pre-burn fuel charge (8.9 lbs.) added at 1245

4th warm up / pre-burn fuel charge (lbs.) added at

5th warm up / pre-burn fuel charge (lbs.) added at

TEST DATA SHEET #10

Unit : Jotul C350 Run : 4 Date : 8 - 1 -06

Room Temperature : 73 °F Correction Factor : Ø

Uncorrected Values are corrected for room temperature : Yes _____ No ✓

Time Test Fuel moisture reading taken : 1150

Calibration Checks : X ✓ Y ✓ 12.0 12.1 22.0 22.1

pc #	Dimen.	Use	TOP		BOTTOM		SIDE		Average Corrected
			Uncor.	Cor.	Uncor.	Cor.	Uncor.	Cor.	
1	2"×4"×8'	K	12.5	13.3	12.5	13.3	12.5	13.3	13.300
2									
3									
4	2"×4"×8'	P	18.0	19.2	18.0	19.2	18.0	19.2	19.200
5	2"×4"×8'	P	18.5	19.8	18.5	19.8	19.0	20.3	19.967
6	2"×4"×8'	P	21.5	23.1	21.5	23.1	21.5	23.1	23.100
7	2"×4"×8'	P							62.267
8	2"×4"×8'	P							
9									
10									
11	2x4x17	T	18.5	19.8	18.0	19.2	18.0	19.2	19.400
12	"	T	18.5	19.8	19.0	20.3	18.5	19.8	19.967
13	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700
14	"	T	22.0	23.7	22.0	23.7	22.0	23.7	23.700
15									86.767
16									
17									
18									
19									
20	Spacers	T	20.0	21.4	21.0	22.5	21.0	22.5	22.133

Key for Use : K = Kindling P = Pretest Fuel T = Test Fuel

	KINDLING	PRETEST FUEL	TEST FUEL
Dry Moisture % :	13.300 %	20.756 %	21.692 %
Wet Moisture % :	11.739 %	17.188 %	17.825 %

To obtain Wet from Dry : $\frac{100 \times \%\ \text{Dry Reading}}{100 + \%\text{Dry Reading}}$ = % Moisture, Wet Basis

Acceptable Ranges : 16 - 20 % wet: 19 - 25 % dry (17.5 - 22.5 on Meter Uncor. reading) at 70°

GAS DATA SHEET #12

WEIGHT: _____ DATE: 8-1-06

UNIT: Jotul C350 RUN: 4 PAGE: 1 OF 1

TIME	SCALE	FUEL	DROP	V.	CO_2	V.	O_2	V.	CO	STATIC	SO_2PPM
0 1430	11.1	8.9	—	.152	3.8	.167	16.4	.061	.60	-.051	300
5 35	9.8	7.6	1.3	.585	14.6	.235	5.9	.036	.35	-.070	275
10 40	8.5	6.3	1.3	.583	14.6	.241	6.0	.021	.20	-.071	300
15 45	7.2	5.0	1.3	.625	15.6	.202	5.0	.018	.17	-.074	300
20 50	5.9	3.7	1.3	.674	16.8	.150	3.7	.024	.23	-.079	300
25 55	5.0	2.8	.9	.596	14.9	.233	5.8	.010	.09	-.076	300
Fan? 30 1500	4.2	2.0	.8	.534	13.3	.297	7.4	.006	.05	-.076	300
35 05	3.5	1.3	.7	.436	10.9	.394	9.8	.008	.07	-.071	300
40 10	3.2	1.0	.3	.295	7.4	.531	13.2	.019	.18	-.070	300
43 15	2.9	.7	.3	.224	5.6	.592	14.8	.0415	.44	-.065	300
50 20	2.8	.6	.1	.213	5.3	.600	15.0	.052	.51	-.063	300
55 25	2.7	.5	.1	.194	4.9	.613	15.3	.061	.60	-.060	300
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.824	*****
60 1530	2.6	.4	.1	.179	4.5	.629	15.7	.061	.60	-.058	300
65 35	2.4	.2	.2	.169	4.2	.598	14.9	.066	.65	-.056	300
70 40	2.2	0	.2	.153	3.8	.655	16.4	.066	.65	-.055	300
75											
80										-.169	
85											
90											
95											
100											
105											
110											
115											
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****		*****
120											
125											
130											
135											
140											
145											
150											
155											
160											
165											
170											
175											
SUBTOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.993	*****
TOTAL	*****	*****	*****	*****	*****	*****	*****	*****	*****	-.066	*****

PREBURN DATA SHEET #13

UNIT: Jotul C350 RUN: 4 DATE: 8-1-06 PAGE: 1 of 1

TIME	SCALE	DROP	STACK	TOP	LF SIDE	BACK	RT SIDE	BOTTOM	FIREBOX	SEC/CAT	AMBIENT	STATIC	COMMENTS
0 / 1245	11.2	—	408	747	380	542	496	686	953	1024	84	-.068	PREBURN START: # 9.0 UP
5 / 50	9.7	1.5	628	832	370	392	487	591	920	1408	83	-.076	COAL BED SCALE RANGE:
10 / 55	8.7	1.0	596	852	358	370	489	544	940	1436	84	-.076	2.2 → 1.8
15 / 1300	7.6	1.1	565	831	355	358	465	508	940	1427	85	-.073	PRIMARY AIR: wide open
20 / 05	6.7	.9	536	826	365	353	459	482	950	1400	86	-.072	SECONDARY AIR: N/A
25 / 10	6.0	.7	510	831	356	353	470	465	956	1412	84	-.072	FAN: High
30 / 15	5.4	.6	482	779	370	343	468	444	962	1315	85	-.069	PUMPS ON AT: 1315
35 / 20	4.9	.5	468	765	368	338	465	441	954	1354	84	-.069	CHECK WB/DB:
40 / 25	4.4	.5	463	744	351	335	452	443	957	1412	83	-.069	
45 / 30	4.0	.4	453	729	350	334	453	435	995	1231	83	-.067	
50 / 35	3.6	.4	428	690	350	332	449	436	1021	1216	81	-.065	
55 / 40	3.4	.2	392	640	354	329	442	432	1011	1074	83	-.062	
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	
60 / 1345	3.2	.2	374	597	341	323	441	425	978	1012	83	-.060	
65 / 50	3.1	.1	357	566	343	312	436	414	935	921	84	-.059	
70 / 55	2.9	.2	343	535	347	301	428	406	910	872	83	-.056	
75 / 1400	2.8	.1	329	504	332	290	419	401	880	843	84	-.055	
80 / 05	2.7	.1	319	478	324	279	410	396	858	827	82	-.055	
85 / 10	2.6	.1	310	455	315	270	403	390	839	816	81	-.054	
90 / 15	2.5	.1	301	434	302	262	392	384	823	781	81	-.053	
95 / 20	2.5	ϕ	293	417	296	255	385	378	799	767	80	-.053	
100 / 25	2.3	.2	286	399	292	244	374	369	777	752	79	-.052	
105 / 30	2.2	.1	281	389	287	247	363	367	746	701	79	-.051	
110 / 35													

Jotul C350

Temperature Data Sheet #14

Run 4
8/1/06

Time	Stack	Top	LT Side	Back	Rt Side	Bottom	Firebox	Sec/Cat	Ambient	Tube Furn	Smpl Box	Smpl Out	C-Gas Box	C-Gas Out	SO2 Out
********	Chn 103	Chn 104	Chn 105	Chn 106	Chn 107	Chn 108	Chn 109	Chn 110	Chn 111	Chn 112	Chn 113	Chn 114	Chn 115	Chn 116	Chn 117
0	281	389	287	247	363	367	746	701	79	1309	229	58	238	35	33
5	518	508	271	246	360	362	711	1287	81	1308	230	42	239	35	33
10	543	645	280	255	363	350	746	1315	82	1308	231	43	243	35	33
15	564	718	287	272	377	350	798	1358	82	1308	232	43	246	35	34
20	579	783	295	296	400	349	861	1368	83	1311	232	44	247	35	34
25	569	811	311	325	421	350	947	1357	84	1317	232	44	248	35	34
30	541	820	326	352	440	358	985	1394	85	1324	233	45	248	36	34
35	509	768	328	364	447	375	1003	1369	85	1331	234	46	243	36	35
40	447	733	340	374	461	379	988	1189	86	1336	235	47	238	36	35
45	409	655	329	362	457	393	953	1086	86	1342	234	47	236	36	35
50	377	608	333	348	453	399	922	975	86	1346	234	47	234	37	35
55	355	551	332	331	441	403	896	917	84	1348	234	47	231	37	36
60	338	512	320	317	430	399	858	890	84	1350	233	47	231	37	36
65	324	471	313	304	413	396	831	852	83	1352	233	47	231	37	36
70	310	437	301	297	403	393	799	797	83	1354	233	47	231	37	36

TEMPERATURE DATA SHEET #14A

		TEST TIME	70		
STACK AVG	444	TOP AVG	627	LT SIDE AVG	310
BACK AVG	313	RT SIDE AVG	415	BOTTOM AVG	375
FIREBOX AVG	870	SEC/CAT AVG	1124	AMBIENT AVG	84

END	366.1	
START	330.6	
	35.5	DELTA T

CIRCLE: **LOSS** / **GAIN**

ZERO / SPAN CHECK DATA SHEET #15-1

Date : 8 - 1 - 06 Analyte : CO_2 (15-1)

Unit : Jotol C350 Run # : 4

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO_2 Cyl. Press. : 1140 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % CO_2 Cyl. Press. : 960 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 407069

Range : 0 - 25.0 % CO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % CO_2

EPA Control Limits = ± 2.5% of 25.0 % CO_2 = ± 0.625 % CO_2

Method 28 A = ± .2 % of 25.0 % CO_2 = ± .05 % CO_2

PRE RUN Audit : by : C. Wadsworth Time : 1225 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.001	-.013	-.013	-.051
SPAN	50.0	.500	12.50	49.8	.498	12.447	-.053	-.212

POST RUN Audit : by : C. Wadsworth Time : 1550 Temp : 82 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.002	-.038	-.038	-.151
SPAN	50.0	.500	12.50	49.7	.497	12.422	-.078	-.312

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-2

Date : 8-1-06 Analyte : O_2 (15-2)

Unit : Jotul C350 Run # : 4

Zero Cyl. # : 168TAC 3A Conc. : 0.00 % O_2 Cyl. Press. : 1140 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 12.50 % O_2 Cyl. Press. : 960 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : TELEDYNE Model : 320 A SN : 37400

Range : 0 - 25.0 % O_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 25.0 % O_2

EPA Control Limits = ± 2.5% of 25.0 % O_2 = ± 0.625 % O_2

Method 28 A = ± .2 % of 25.0 % O_2 = ± .05 % O_2

PRE RUN Audit : by : C. Wallington Time : 1225 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.002	.040	.040	.161
SPAN	12.50	.500	1250	12.5	.500	12.471	-.029	-.115

POST RUN Audit : by : C. Wallington Time : 1550 Temp : 82 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	.015	.015	.061
SPAN	12.50	.500	12.50	12.5	.502	12.521	.021	.084

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-3

Date : 8 – 1 – 06 Analyte : CO (15-3)

Unit : Jotul C350 Run # : 4

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 % CO Cyl. Press. : 1140 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC-41627 Conc. : 4.99 % CO Cyl. Press. : 960 PSI

Certified by : AIR LIQUIDE Date : 11-1-05

Analyzer : Make : HORIBA Model : PIR-2000 SN : 408005

Range : 0 - 10.0 % CO Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 10.0 % CO

EPA Control Limits = ± 2.5% of 10.0 % CO = ± 0. 25 % CO

Method 28 A = ± .2 % of 10.0 % CO = ± .02 % CO

PRE RUN Audit : by : C. Worthington Time : 1225 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	-.006	-.006	-.059
SPAN	49.9	.499	4.99	49.5	.495	4.961	-.029	-.293

POST RUN Audit : by : C. Worthington Time : 1550 Temp : 82 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	%	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.1	.001	-.006	-.006	-.059
SPAN	49.9	.499	4.99	49.6	.496	4.971	-.019	-.192

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

ZERO / SPAN CHECK DATA SHEET #15-4

Date : 8 - 1 - 06 Analyte : SO_2 (15-4)

Unit : Jotul C350 Run # : 4

Zero Cyl. # : 168TAC 3-A Conc. : 0.00 ppm SO_2 Cyl. Press. : 1140 PSI

Certified by : AIR LIQUIDE Date : 04-19-04

Span Cyl. # : CC62184 Conc. : 1290 ppm SO_2 Cyl. Press. : 400 PSI

Certified by : AIR LIQUIDE Date : 01-29-01

Analyzer : Make : HORIBA Model : PIR-2000 SN : 403019

Range : 0 - 2500 ppm SO_2 Analyzer Output : 0 - 1.0 v.

Flow : 1.5 SCFH Measured by : Rotameter

EPA Span Value = 2500 ppm SO_2

EPA Control Limits = ± 2.5% of 2500 ppm SO_2 = ± 62.5 ppm SO_2

PRE RUN Audit : by : C. Wentz Time : 1225 Temp : 80 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.002	3.269	3.269	.131
SPAN	51.6	.516	1290	51.8	.518	1294.3	4.300	.172

POST RUN Audit : by : C. Wentz Time : 1550 Temp : 82 ° F

AUDIT RESULTS

Point #	Expected Response			Actual Response			± Conc. Difference	Δ %
	Meter	DVM	PPM	Meter	DVM	%		
ZERO	00.0	.000	00.0	00.0	-.003	.786	.786	.031
SPAN	51.6	.516	1290	51.6	.516	1289.4	-.600	-.024

± Conc. Difference = Act % - Exp (Std) %

Zero % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X 100

Span % Difference = $\frac{\text{Act \% (ppm) - Exp \% (ppm)}}{\text{Full Scale Value}}$ X100

QUALITY CHECKS DATA SHEET # 16

UNIT : Jotol C350 RUN : 4 DATE : 8-1-06

Thermocouple Check:

T/C # 1	— °F	T/C # 13	67.2 °F
T/C # 2	— °F	T/C # 14	65.8 °F
T/C # 3	66.1 °F	T/C # 15	67.5 °F
T/C # 4	63.1 °F	T/C # 16	67.0 °F
T/C # 5	62.4 °F	T/C # 17	65.0 °F
T/C # 6	62.7 °F	T/C # 18	68.4 °F
T/C # 7	62.6 °F	T/C # 19	64.8 °F
T/C # 8	62.6 °F	T/C # 20	— °F
T/C # 9	62.6 °F	T/C # 21	— °F
T/C # 10	62.6 °F	T/C # 22	— °F
T/C # 11	61.8 °F	T/C # 23	— °F
T/C # 12	72.0 °F	T/C # 24	— °F

Thermocouple Readout:

Pretest zero and span check and calibration — post test zero and span — % difference

ZERO .1 °F Adj. to 0.0 °F ZERO .16 °F Difference .030 %

SPAN 1999.0 °F Adj. to 2000.0 °F SPAN 2001.2 °F Difference .060 %

Thermocouple Readout Pretest Linearity Check:

0	= 0.0 °F	200	= 200.3 °F	400	= 400.0 °F
600	= 599.9 °F	800	= 799.8 °F	1000	= 999.8 °F
1200	= 1199.7 °F	1400	= 1399.4 °F	1600	= 1599.5 °F
1800	= 1799.6 °F	2000	= 2000.0 °F		

Sample Train Leak Check	Pre ✓	Post X
C-gas Train Leak Check	Pre ✓	Post ✓
SO_2 Train Leak Check	Pre ✓	Post ✓
Static Gauge Zero Check	Pre ✓	Post ✓

Scale Check Pre : 15.0 − 5.0 = 10.0

Post : 12.1 − 2.1 = 10.0

Stack Cleaned Prior to Test Run : YES ____ NO X

Inspection Certificate

Phillips Morris Scale Company
Partners in Weighing Systems
934 Elliott Avenue W.
Seattle, WA 98119
Ph#(206)284-6090
Fax#(206)282-6612

Customer: LOKEE TESTING
Address: 13235 Prarie Circle
Sumner WA 98390
Technician: Patrick McLellan

Authorization Signature: _____

Date of Inspection: 11-26-02
Next Inspection Due: 5-03

Certification Type
- ✓ Standard
- __ ISO 9000
- __ MIL STD-45662

Equipment Tested

Indicator		Base	Options Installed	
Make	Weightronix		Printer	
Model	WI-110		Score Board	
SR#	16409		Computer	
Class	III		Other	
Cap.	1000 lbs			

Pre-test	Post-test	Manufacturer Tolerance
Ø	Ø	
	499.9	
998.7	1000.0	

Corner Test P ✓ F __
Shift Test P ✓ F __
Static Test 2 min. __ ✓ 5 min. __

Weight Kit# _____ NIST# _____

Serial Numbers of Weights Used (or copy of certificate)

T23-13	T23-14			

Any changes to document or scale not authorized by Phillips & Morris Scale Company VOIDS this certificate.

WASHINGTON STATE DEPARTMENT OF **AGRICULTURE**

METROLOGY LABORATORY

Receipt Date:	January 29, 2002	State Test Number:	L2017-1
Test Date:	February 13, 2002	Group ID:	SHOP
Report Date:	February 13, 2002	Due Date:	February 13, 2004

CALIBRATION REPORT

Phillips Morris Scale Company		Item(s) Submitted:	See Table Below
934 Elliott Ave. W		Specification:	NIST HB 105-1, Class F
Seattle, WA 98119-3608		Condition:	Good
Contact:	Todd Mackie	Temperature:	21.0 °C
Phone:	206-284-6090	Pressure:	762.0 mmHg
PO Number:	2-2-009237	Humidity:	35 % RH
SOP:	8	Technician ID:	DW

Description	Value / Range	Qty	Material	Manufacture	Serial Number
Test Weight	1000 lb	5	Cast Iron	Rice Lake	OFT0, OFT1, OFT2, ~~OFSY, OFSZ~~
Test Weight	500 lb	12	Cast Iron	Rice Lake	T23-13 to T23-16, T23-20, T23-24, T23-26, T23-28 to T23-32
Test Weight	50 lb	30	Cast Iron	Rice Lake	877B, N1039, N1041, T23-1 to T23-10, T23-19 to T23-28, WA171-0, WA1712-0 to WA172-2, WA173-2, WA237, X694
Test Weight	25 lb	2	Cast Iron	Rice Lake	WA238, T23-11
Weight Set, 7 pc	10 lb - 8 oz	1	Stainless Steel	Rice Lake	WA177-7
Weight Set, 12 pc	5 kg - 200 g	1	Stainless Steel	Rice Lake	SK

The item(s) listed above have been found and/or left within the stated tolerances for the specification stated above, except as noted. The item(s) listed above have been compared to the Standards of the State of Washington, which are currently in control. These standards values are traceable to the National Institute of Standards and Technology (NIST through NIST Test Numbers 822/264514-01 and Minnesota Metrology Laboratory Report Number 307 430. Calibration processes were monitored and found to be in control. The expanded uncertainty (k=2) for each item listed in this report is less than 1/3 of the appropriate tolerance. Results apply to items identified in this report only. This report may not be reproduced, except in full, unless permission for the publication of an abstract is obtained in writing from the calibrating organization issuing this report.

LABORATORY SERVICES DIVISION
WEIGHTS AND MEASURES PROGRAM

Dan Wright

DAN WRIGHT
STATE METROLOGIST

MAR 0 8 2002

NVLAP

NVLAP LAB CODE 200446-

2747 29th Avenue Southwest ▼ Tumwater, Washington 98512 ▼ (360) 753-5042 ▼ (360) 586-4728 fax

Established 1974

QUALITY CONTROL SERVICES

LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE
2340 S.E. 11th Avenue • Portland, Oregon 97214
P.O. Box 14831 • Portland, Oregon 97293 • (503) 236-2712 • FAX: (503) 235-2535

Lokee Testing Labs
13235 Prairie Circle East
Sumner, WA. 98390
Chip Wadington

Report Number: EESPC37010004060505

CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	A120S	37010004	N/A	Lab

Units	Readability	SOP Used	Cal. Date	Last Cal.	Cal. Due
Grams	0.0001	QC004	05/05/2006	12/05/2005	11/2006

FUNCTIONAL CHECKS

ECCENTRICITY:	LINEARITY:	REPEATABILITY:
Test Wt: 100 Tol: 0.0003	Test Wt: 50x2 Tol: 0.0004	Test Wt: 100 Tol: 0.0001
AS FOUND: Pass: ☑ Fail: ☐	AS FOUND: Pass: ☑ Fail: ☐	AS FOUND: Pass: ☑ Fail: ☐
AS LEFT: Pass: ☑ Fail: ☐	AS LEFT: Pass: ☑ Fail: ☐	AS LEFT: Pass: ☑ Fail: ☐

CALIBRATION DATA

Standards	As Found	As Left
100	100.0002	100.0001
70	70.0002	70.0001
50	50.0001	50.0001
20	20.0001	20.0000
10	10.0001	10.0001
5	5.0001	5.0000

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal. Date	Cal. Due	Traceable ID#
Weight Set	R.L./Troemner	1MG-25KG	A45	04/01/2006	07/2007	822/268710-03

Comments / Info Concerning This Calibration:

Permanent Information Concerning This Instrument:

Technician: D.Deleasa

Signature: D. Deleasa

QUALITY CONTROL SERVICES

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2340 S.E. 11th Avenue • Portland, Oregon 97214
P.O. Box 14831 • Portland, Oregon 97293 • (503) 236-2712 • FAX: (503) 235-2535

Established 1974

Lokee Testing Labs
13235 Prairie Circle East
Sumner, WA. 98390
Chip Wadington

Report Number: EESPC37010004051205

CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	A120S	37010004	N/A	Lab

Units	Readability	SOP Used	Cal. Date	Last Cal.	Cal. Due
Grams	0.0001	QC004	12/05/2005	05/11/2005	06/2006

FUNCTIONAL CHECKS

ECCENTRICITY:	LINEARITY:	REPEATABILITY:
Test Wt: 100 Tol: 0.0003	Test Wt: 50x2 Tol: 0.0004	Test Wt: 100 Tol: 0.0001
AS FOUND: Pass: ☑ Fail: ☐	AS FOUND: Pass: ☑ Fail: ☐	AS FOUND: Pass: ☑ Fail: ☐
AS LEFT: Pass: ☑ Fail: ☐	AS LEFT: Pass: ☑ Fail: ☐	AS LEFT: Pass: ☑ Fail: ☐

CALIBRATION DATA

Standards	As Found	As Left
100	100.0002	100.0000
70	70.0001	70.0000
50	50.0001	50.0000
20	20.0000	20.0000
10	10.0000	10.0000
5	5.0000	5.0000

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal. Date	Cal. Due	Traceable ID#
Weight Set	R.L./Troemner	1MG-25KG	A45	12/20/2004	12/2005	822/268710-03

Comments / Info Concerning This Calibration:

Permanent Information Concerning This Instrument:

Technician: D.Deleasa

Signature: D. Deleasa

Established 1974

QUALITY CONTROL SERVICES

LABORATORY AND METROLOGY EQUIPMENT: SALES AND SERVICE
2340 S.E. 11th Avenue • Portland, Oregon 97214
P.O. Box 14831 • Portland, Oregon 97293 • (503) 236-2712 • FAX: (503) 235-2535

Lokee Testing Labs
13235 Prairie Circle East
Sumner, WA. 98390
Chip Wadington

Report Number: EESPC37010004050511

CERTIFICATE OF CALIBRATION WITH DATA

INSTRUMENT INFORMATION

Item	Make	Model	Serial Number	Customer ID	Location
Balance	Sartorius	A120S	37010004	N/A	Lab

Units	Readability	SOP Used	Cal. Date	Last Cal.	Cal. Due
Grams	0.0001	QC004	05/11/2005	11/05/2004	11/2005

FUNCTIONAL CHECKS

ECCENTRICITY:	LINEARITY:	REPEATABILITY:
Test Wt: 100 Tol: 0.0003	Test Wt: 50x2 Tol: 0.0004	Test Wt: 100 Tol: 0.0001
AS FOUND: Pass: ☑ Fail: ☐	AS FOUND: Pass: ☑ Fail: ☐	AS FOUND: Pass: ☑ Fail: ☐
AS LEFT: Pass: ☑ Fail: ☐	AS LEFT: Pass: ☑ Fail: ☐	AS LEFT: Pass: ☑ Fail: ☐

CALIBRATION DATA

Standards	As Found	As Left
100	100.0004	100.0000
70	70.0003	70.0000
50	50.0002	50.0000
20	20.0001	20.0000
10	10.0001	10.0000
5	5.0000	5.0000

CALIBRATION STANDARDS

Item	Make	Model	Serial Number	Cal. Date	Cal. Due	Traceable ID#
Weight Set	R.L./Troemner	1MG-25KG	A45	12/20/2004	12/2005	822/268710-03

Comments / Info Concerning This Calibration:

Permanent Information Concerning This Instrument:

Technician: D.Deleasa

Signature: D. Deleasa

Thermocouple Calibration Record Semi-Annual

Thermocouples Check against
Reference Thermometer serial number 9123454
Ice Water Bath 32.0
Boiling Water 212.0
Room Temperature 71
Barometric Pressure 30.11
DATE: 5-15-2026

TC	Location	Ice Bath Temp	Boiling Water Temp
1	Wet Bulb	32.0	211.9
2	Dry Bulb	32.0	212.1
3	Stack	32.4	211.8
4	Stove Top	32.3	212.0
5	Left Side	32.0	211.9
6	Back	32.1	212.0
7	Right Side	32.0	212.0
8	Bottom	32.1	211.8
9	Firebox	32.4	211.5
10	Secondary/Cat	32.2	211.8
11	Ambient	32.2	212.0
12	Tube Furnace	32.6	212.2
13	Sample Box	32.1	211.8
14	Impinger Out	32.0	212.0
15	C. Gas Box	32.2	211.3
16	C. Gas Out	32.2	211.9
17	SO2 Out	32.1	211.7
18	Upper Ambient	32.3	211.9
19			
20			
21			
22			
23	Calibrator	32.0	212.0
24	Oven	32.3	211.7

Thermocouple Readout Semi-Annual Calibration Data Sheet

Date: 5·15·2006
Ambient Temperature: 73
Technician: Chp W.

Thermocouple Number: T/C Readout
Barometric Pressure: 30.11
Reference: Mercury in glass FISHER #9123454
Other: OMEGA CL-300

Reference Point No. [a]	Source [b]	Reference Thermometer Temperature °F	Thermocouple Potentiometer Temperature °F	Difference (%)[c]
32	Ice Water	32.0	32.0	Ø
212	Boiling Water	212.0	212.0	Ø
250	Omega	250.0	249.9	.040
300	Omega	300.0	299.8	.067
400	Omega	400.0	399.7	.075
500	Omega	500.0	499.8	.040
600	Omega	600.0	599.7	.050
700	Omega	700.0	699.7	.043
800	Omega	800.0	799.7	.038
900	Omega	900.0	899.8	.022
1000	Omega	1000.0	999.7	.030
1200	Omega	1200.0	1199.6	.033
1400	Omega	1400.0	1399.7	.021
1600	Omega	1600.0	1599.7	.019
1800	Omega	1800.0	1899.7	.016
2000	Omega	2000.0	2000.0	Ø

[a] Every 50°F for each reference point
[b] Type of Calibration System Used
[c] $\frac{\text{(reference temperature) - (thermocouple temperature)}}{\text{reference temperature}} * 100$

TRACEABILITY DOCUMENTATION Semi-Annual

S02 INJECTION ROTAMETER, DRY GAS METER AND SLING PSYCHROMETER THERMOMETERS IN LAB. CHECKED AGAINST FISHER SN 9123454 (NIST).

DATE: 5-15-2006

SO^2 INJECTION ROTAMETER FISHER SN 9123454

NIST Traceable

Actual	°C = °F	°F
0.0	32.0	32.0
26.8	80.2	80.2
34.2	93.6	93.6
50.6	123.1	123.0

DRY GAS METER THERMOCOUPLES

Actual	°C = °F	5H in	5H out	KK
0.0	32.0	32.0	32.0	32.0
26.0	78.8	78.6	78.9	78.7
33.2	91.8	92.1	91.8	91.7
49.2	120.6	120.3	120.5	120.5

SLING PSYCHROMETER

Actual	°C = °F	Wet Bulb	Dry Bulb
0.0	32.0	32.0	32.0
18.9	66.0	66.0	46.0
29.1	84.4	84.4	84.4
35.6	96.1	96.0	96.0

Conversions = °F = (°C × 1.8) + 32 °C = (°F-32)÷1.8

VANEOMETER CALIBRATION

LoKee Testing Lab uses a Dwyer Model #480 Vaneometer to measure test chamber air velocity. The manufacturer's specifications for accuracy are ± 5.0% to 100 FPM and ± 10% from FPM to top of scale. LoKee Testing Lab insures that the instrument is level and clean prior to taking each reading. According to EPA personnel (Westlin, RTP) no further calibration of the instrument is necessary.

DRAFT GAUGE CALIBRATION

LoKee Testing Lab uses a Dwyer model 115-AV 0-0.25" inclined water manometer (readability resolution ± 0.001" of water) to measure the static pressure in the stack. Once leveled and zeroed as per the manufacturer's written operating instructions, the Dwyer manometer is a primary standard and requires no additional calibration.

The manometer is leveled and zeroed at the start of each test run, checked as necessary during the run to verify the settings have not changed and again at the end of each test run. The results of each check are recorded on Data Sheet #16 in each test run.

BAROMETER CALIBRATION

LoKee Testing Lab uses a Princo Model 469 NOVA Mercury Barometer to measure barometric pressure. When installed and maintained as per the manufacturer's written operating instruction, the Princo Model 469 Mercury Barometer is a primary standard and needs no further calibration.

MOISTURE METER CALIBRATION

The Delmhorst Model RC-1C, SN 16152 Moisture Meter is calibrated each time the meter is used by adjusting the zero and span calibration. The potentiometers of each calibration point (X = zero, Y = span) are adjusted until the meter is calibrated correctly. The meter is then checked against a calibration block (Delmhorst Model MCS-1, moisture content standard at 12.0% and 22.0%) in its normal operating range of 11-25%.

LoKee Testing Lab also has a second moisture meter, Delmhorst Model G-30, SN 2477 to use as a backup.

POST TEST METER BOX AUDIT DATA SHEET # 32

UNIT: Jotul C350 DATE: 8-4-2006

TEST DATA

RUN #	1	2	3	4	5	6	7	8	9	10
AVG. ΔH	.169	.182	.151	.144						
MAX VAC	2.0	3.0	2.0	2.0						

Avg. Test Series ΔH: .162 in H_2O Test Series Max Vac: 3.0 in Hg

Audit Dry Gas Meter: K2 Correction (Y) Factor: 1.003 (mcf)

Test Dry Gas Meter: H Correction (Y) Factor: .981 (mcf)

AUDIT DATA

		Audit # 1	Audit #2	Audit #3
BP		30.14	30.14	30.14
VAC		3.0	3.0	3.0
AUDIT METER :				
VOL.	Final	906.578	911.458	916.458
(Vw)	Initial	901.443	906.578	911.458
	Vol.	5.135	4.880	5.000
TEMP (°F)	Initial	73	81	85
(Tw)	Mid	77	83	87
	Final	81	85	89
(°F / °A)	**Avg.**	537	543	547
ΔH	Initial	.162	.162	.162
	Mid	.162	.162	.162
	Final	.162	.162	.162
	Avg.	.162	.162	.162
DRY GAS METER :				
VOL.	Final	715.300	720.300	725.300
(Vd)	Initial	710.055	715.300	720.300
	Vol.	5.245	5.000	5.000
TEMP (°F)	Initial	73	75	77
(Tm)	Mid	74	76	78
	Final	75	77	79
(°F / °A)	**Avg.**	74 534	536	538

$$Y = \frac{(Vw)(mcf)(BP)(Tm)}{(Vd)\left(BP + \frac{DH}{13.6}\right)(Tw)} \qquad \text{Y Factor \% Diff.} = \frac{\text{Act} - \text{Exp}}{\text{Exp}} \times 100$$

NOTE : mcf = meter correction (Y) factor for Dry Gas Meter used as a transfer standard

RUN 1

$$Y = \frac{(5.135)(1.003)(30.14)(534)}{(5.245)\left(30.14 + \frac{.162}{13.6}\right)(537)} = \frac{82894.53}{84924.82} = .976$$

$$\Delta\% = \frac{(.976 - .976)}{.976} \times 100 = \phi \%$$

RUN 2

$$Y = \frac{(4.880)(1.003)(30.14)(536)}{(5.000)\left(30.14 + \frac{.162}{13.6}\right)(543)} = \frac{79073.11}{81862.44} = .966$$

$$\Delta\% = \frac{(.966 - .976)}{.976} \times 100 = -1.025 \%$$

RUN 3

$$Y = \frac{(5.000)(1.003)(30.14)(538)}{(5.000)\left(30.14 + \frac{.162}{13.6}\right)(547)} = \frac{81319.83}{82465.48} = .986$$

$$\Delta\% = \frac{(.986 - .976)}{.976} \times 100 = 1.025 \%$$

NOTE : The Y factor % difference must be < ± 5.0 % to be acceptable

INTERPOLATED Y FACTOR

$\underset{(A)}{.1}$ inch H_2O ΔH = $\underset{(C)}{.968}$ Calculated calibration Y factor from calibrations

$\underset{(B)}{.2}$ inch H_2O ΔH = $\underset{(D)}{.981}$ Calculated calibration Y factor from calibrations

$$\frac{.2}{(B)} - \frac{.1}{(A)} = .1 \times 100 = \underset{(E)}{10}$$

$$\frac{.981}{(D)} - \frac{.968}{(C)} = .013 \quad \frac{10}{(E)} \quad \frac{.0013}{(F)}$$

$$\frac{.162}{\text{Avg } \Delta H} - \frac{.1}{(A)} = .062 \times 100 = \underset{(G)}{6.2}$$

$$\left[\frac{.0013}{(F)} \times \frac{6.2}{(G)}\right] + \frac{.968}{(C)} = \underset{\text{Interpolated Y factor}}{.976}$$

Volume Metering System Leak Check : 0.000 inch H_2O in one minute

DRY GAS METER CALIBRATION

DATE : 5-15-2006 DRY GAS METER : H BOX : 5

BAROMETRIC PRESSURE 30.04 in. Hg.				Wet Test Meter Correction Factor Y= 1.003			
Orifice Manometer Setting, ΔH, in. H_2O		.1	.2	.3	.5	.75	1.0
Gas Volume Wet Test Meter Vw ft^3	Final	876.368	881.355	886.355	891.860	896.876	901.900
	Initial	871.000	876.368	881.355	886.355	891.860	896.876
	Vw ft^3	5.368	4.987	5.000	5.505	5.016	5.024
Gas Volume Dry Test Meter Vd ft^3	Final	490.500	495.500	500.500	506.000	511.000	516.000
	Initial	485.000	490.500	495.500	500.500	506.000	511.000
	Vw ft^3	5.500	5.000	5.000	5.500	5.000	5.000
Wet Test Meter Temperature tw	Initial	75	79	83	82	80	80
	Middle	77	81	82	81	80	80
	Final	79	83	82	80	80	80
	Average	77 (537)	81 (541)	(542)	(541)	(540)	(540)
Dry Test Meter Temperature tm	Initial	72	70	70	70	71	71
	Middle	71	70	70	70	71	71
	Final	70	70	70	71	71	71
	Average	71 (531)	70 (530)	70 (530)	70 (530)	71 (531)	(531)
$Y = \frac{(W_{mcf})(Vw)\,(Pb)\,(tm)}{Vd\left(Pb + \frac{\Delta H}{13.6}\right)(tw)}$		.968	.981	.980	.982	.988	.989

Average Y= .981

9,025 1.454
8,125 6.597
8,037 9.447
8,130 6.529

METER BOX CALIBRATION

Date : 11/10/05
Calibrated By : J.C.
Dry Gas Meterbox ID : K2

Barometric Pressure, Pb = 28.37 in. Hg
Vacuum = 0.0 in. Hg

Orifice Manometer Setting, Delta H in. H20		0.10	0.10	0.10	0.10	0.10	0.10
Gas Volume Wet Test Meter Vw, cu. ft.		5.000	5.000	5.000	5.000	5.000	5.000
Gas Volume Dry Gas Meter							
M Final		455.032	460.080	465.135	470.200	475.266	480.333
M Initial		450.000	455.032	460.080	465.135	470.200	475.266
Vd, cu. ft.		5.032	5.048	5.055	5.065	5.066	5.067
Wet Test Meter							
tw Deg F		78	78	78	78	78	78
tw Deg A		538	538	538	538	538	538
Dry Gas Meter Outlet, tmo	**1)**	80	83	84	85	85	86
	2)	82	84	84	85	86	86
	3)	84	85	85	86	86	87
Dry Gas Meter Inlet tmi	**1)**	81	84	85	86	87	88
	2)	82	85	86	87	87	88
	3)	84	86	86	87	87	88
Mean tm, Deg F		82	85	85	86	86	87
Mean tm, Deg A		542	545	545	546	546	547
Results :							
	Y =	1.001	1.002	1.002	1.002	1.002	1.003

Averages :

Y = **1.002**

Avg = 1.003

METER BOX CALIBRATION

Date : 11/10/05
Calibrated By : J.C.
Dry Gas Meterbox ID : K2

Barometric Pressure, Pb = 28.37 in. Hg
Vacuum = 0.0 in. Hg

Orifice Manometer Setting, Delta H in. H20		0.20	0.20	0.20	0.20	0.20	0.20
Gas Volume Wet Test Meter Vw, cu. ft.		5.000	5.000	5.000	5.000	5.000	5.000
Gas Volume Dry Gas Meter							
M Final		485.422	490.521	495.618	500.720	505.829	510.935
M Initial		480.333	485.422	490.521	495.618	500.720	505.829
Vd, cu. ft.		5.089	5.099	5.097	5.102	5.109	5.106
Wet Test Meter							
tw Deg F		78	78	78	78	78	78
tw Deg A		538	538	538	538	538	538
Dry Gas Meter Outlet, tmo	**1)**	88	89	89	89	90	90
	2)	88	89	89	89	90	90
	3)	89	89	89	90	90	90
Dry Gas Meter Inlet tmi	**1)**	89	90	90	91	92	92
	2)	90	91	91	92	92	92
	3)	90	91	92	92	93	92
Mean tm, Deg F		89	90	90	91	91	91
Mean tm, Deg A		549	550	550	551	551	551

Results :

	Y =	1.002	1.002	1.002	1.002	1.002	1.002

Averages :

Y = 1.002

METER BOX CALIBRATION

Date : 11/10/05
Calibrated By : J.C.
Dry Gas Meterbox ID : K2

Barometric Pressure, Pb = 28.37 in. Hg
Vacuum = 0.0 in. Hg

Orifice Manometer Setting, Delta H in. H20		0.30	0.30	0.30	0.30	0.30	0.30
Gas Volume Wet Test Meter Vw, cu. ft.		5.000	5.000	5.000	5.000	5.000	5.000
Gas Volume Dry Gas Meter							
M Final		516.042	521.144	526.255	531.375	536.501	541.628
M Initial		510.935	516.042	521.144	526.255	531.375	536.501
Vd, cu. ft.		5.107	5.102	5.111	5.120	5.126	5.127
Wet Test Meter							
tw Deg F		78	78	78	78	78	78
tw Deg A		538	538	538	538	538	538
Dry Gas Meter Outlet, tmo	**1)**	90	90	91	92	92	93
	2)	90	91	91	92	92	93
	3)	91	91	91	92	93	93
Dry Gas Meter Inlet tmi	**1)**	90	92	92	93	94	95
	2)	91	92	93	94	95	96
	3)	92	92	93	94	96	96
Mean tm, Deg F		91	91	92	93	94	94
Mean tm, Deg A		551	551	552	553	554	554

Results :

Y =	1.002	1.003	1.003	1.003	1.003	1.004

Averages :

Y = 1.003

METER BOX CALIBRATION

Date : 11/10/05
Calibrated By : J.C.
Dry Gas Meterbox ID : K2

Barometric Pressure, Pb = 28.37 in. Hg
Vacuum = 0.0 in. Hg

Orifice Manometer Setting, Delta H in. H20		0.50	0.50	0.50	0.50	0.50	0.50
Gas Volume Wet Test Meter Vw, cu. ft.		5.000	5.000	5.000	5.000	5.000	5.000
Gas Volume Dry Gas Meter							
M Final		546.755	551.874	557.001	562.132	567.276	572.421
M Initial		541.628	546.755	551.874	557.001	562.132	567.276
Vd, cu. ft.		5.127	5.119	5.127	5.131	5.144	5.145
Wet Test Meter							
tw Deg F		78	79	79	79	79	79
tw Deg A		538	539	539	539	539	539
Dry Gas Meter Outlet, tmo	**1)**	93	93	94	95	96	96
	2)	93	94	95	96	96	97
	3)	94	94	95	96	96	97
Dry Gas Meter Inlet tmi	**1)**	93	94	95	96	97	97
	2)	94	95	96	97	98	98
	3)	95	96	98	98	99	100
Mean tm, Deg F		94	94	96	96	97	98
Mean tm, Deg A		554	554	556	556	557	558

Results :

Y =	1.003	1.003	1.004	1.004	1.003	1.004

Averages :

Y = **1.004**

METER BOX CALIBRATION

Date : 11/10/05
Calibrated By : J.C.
Dry Gas Meterbox ID : K2

Barometric Pressure, Pb = 28.37 in. Hg
Vacuum = 0.0 in. Hg

Orifice Manometer Setting, Delta H in. H20		0.75	0.75	0.75	0.75	0.75	0.75
Gas Volume Wet Test Meter Vw, cu. ft.		5.000	5.000	5.000	5.000	5.000	5.000
Gas Volume Dry Gas Meter							
M Final		577.560	582.704	587.855	593.017	598.174	603.330
M Initial		572.421	577.560	582.704	587.855	593.017	598.174
Vd, cu. ft.		5.139	5.144	5.151	5.162	5.157	5.156
Wet Test Meter							
tw Deg F		79	79	79	79	80	80
tw Deg A		539	539	539	539	540	540
Dry Gas Meter Outlet, tmo	**1)**	95	96	97	99	99	100
	2)	95	96	98	99	99	99
	3)	96	97	98	100	100	100
Dry Gas Meter Inlet tmi	**1)**	95	97	99	100	101	101
	2)	97	98	100	100	101	101
	3)	100	100	100	101	102	101
Mean tm, Deg F		96	97	99	100	100	100
Mean tm, Deg A		556	557	559	560	560	560

Results :

Y =	1.002	1.003	1.004	1.004	1.004	1.004

Averages :

Y = 1.004

METER BOX CALIBRATION

Date : 11/10/05
Calibrated By : J.C.
Dry Gas Meterbox ID : K2

Barometric Pressure, Pb = 28.37 in. Hg
Vacuum = 0.0 in. Hg

Orifice Manometer Setting, Delta H in. H20		1.00	1.00	1.00	1.00	1.00	1.00
Gas Volume Wet Test Meter Vw, cu. ft.		5.000	5.000	5.000	5.000	5.000	5.000
Gas Volume Dry Gas Meter							
M Final		608.466	613.628	618.799	623.973	629.155	634.343
M Initial		603.330	608.466	613.628	618.799	623.973	629.155
Vd, cu. ft.		5.136	5.162	5.171	5.174	5.182	5.188
Wet Test Meter							
tw Deg F		80	80	80	80	80	80
tw Deg A		540	540	540	540	540	540
Dry Gas Meter Outlet, tmo	**1)**	98	99	101	102	102	102
	2)	99	101	102	102	102	103
	3)	101	102	102	102	103	103
Dry Gas Meter Inlet tmi	**1)**	95	99	102	103	104	105
	2)	97	101	102	103	104	106
	3)	101	102	103	104	105	106
Mean tm, Deg F		99	101	102	103	103	104
Mean tm, Deg A		559	561	562	563	563	564

Results :

Y =	1.005	1.003	1.004	1.004	1.004	1.004

Averages :

Y = 1.004

WET TEST METER CALIBRATION LOG

Wet Test Meter Serial Number AA 455 Date 9-17-2005

Range of Wet Test Meter Flow Rate 0 - 0.25

Volume of Test Flask Vs 37.850

Satisfactory Leak Check? Yes

Ambient Temperature of Equilibrate Liquid in Wet Test Meter and Reservoir 70

TEST #	MANOMETER READING, *a* mm H_2O	FINAL VOLUME (Vf), l	INITIAL VOLUME (Vi), l	TOTAL VOLUME (Vm), *b* l	FLASK VOLUME (Vs), l	PERCENT ERROR, *c* %
1	∅	3.0	∅ All reset	3.0	3.001	-.033
2	∅	3.0	∅	3.0	3.003	-.100
3	∅	3.0	∅	3.0	3.001	-.033

a - Must be less than 10 mm H_2O (0.4 ' H_2O)

Calculations:

b - Vm - Vf - Vi

c - % error = $\frac{100\,(V_m - V_s)}{V_s}$ = -.055 (± 1 %)

SO_2 ROTAMETER CALIBRATION

Last Cal. : 11-8-05 By : Clp Date : 5-16-2006 By : Clp

Manufacturer : SKC-WEST
SKC ACCUFLOW Digital Flow Calibrator: Model 712 SN : 311325

Barometric Pressure : 30.12 " Hg Temperature : 71

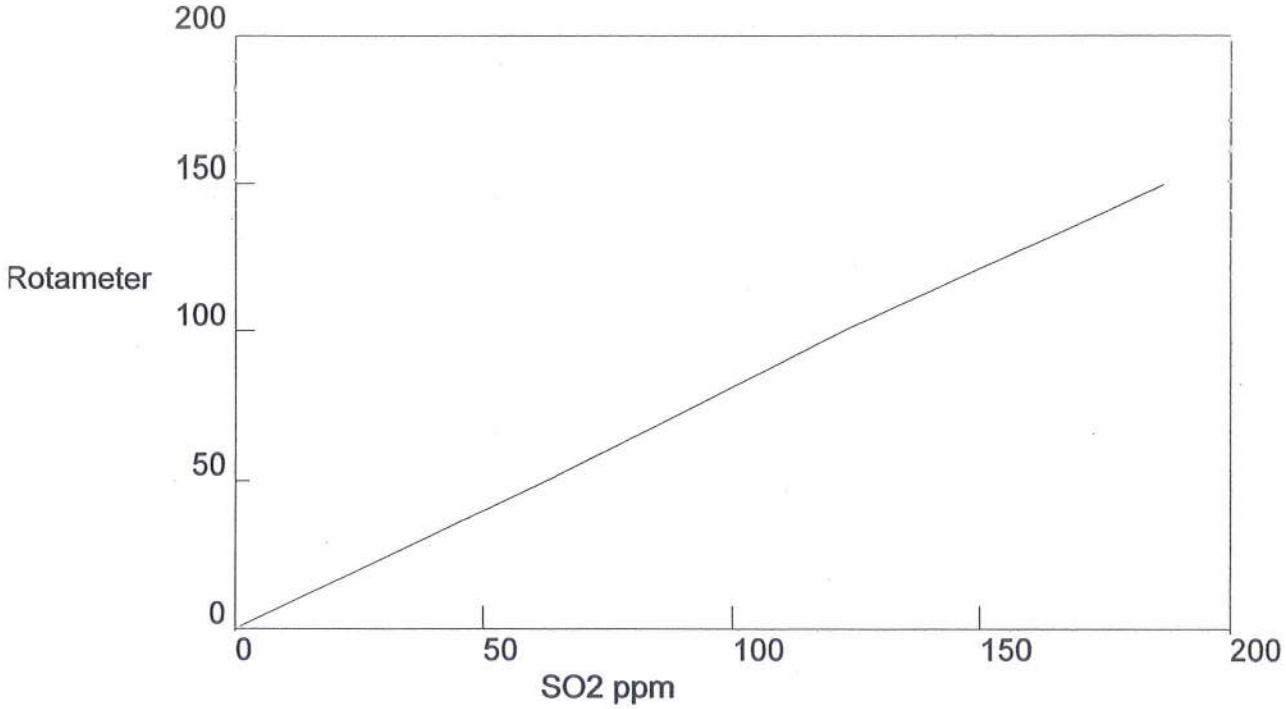
RUN #	50 CC/MINUTE DIGICAL VOLUME	100 CC/MINUTE DIGICAL VOLUME	150 CC/MINUTE DIGICAL VOLUME
1	56.3	120.6	174.2
2	56.5	120.7	174.0
3	57.2	120.9	174.1
4	56.2	121.3	174.3
5	56.6	120.6	173.9
6	56.3	121.0	173.6
7	56.9	121.1	173.9
8	56.8	120.8	174.2
9	56.8	120.7	174.1
10	56.4	120.6	174.3
AVERAGE	56.6 cc/min	120.8 cc/min	174.1 cc/min

SETTING	cc/min
0	0.0
50	56.6
100	120.8
150	174.1

Rotometer setting for 100 cc/minute based on regression with this data.

100 CC / MINUTE = _____

SO2 Rotameter
05/16/06



Regression Output:

Constant		-0.1
Std Err of Y Est		3.1492062492
R Squared		0.9988480713
No. of Observations		4
Degrees of Freedom		2
X Coefficient(s)	1.173	
Std Err of Coef.	0.028167357	

TRACER GAS TRAIN RESPONSE TIME

DATE: 5-15-2006

Elapsed Time	SO_2 Conc. (v.)	SO_2 Conc. (v.)	SO_2 Conc. (v.)
00 sec	.516	.514	.514
15	.325	.326	.330
30	.200	.202	.195
45	.122	.118	.120
60	.082	.080	.079
75	.071	.069	.065
90	.052	.049	.049
105	.039	.036	.035
120	.022	.020	.021
135	.011	.010	.010
150	.006	.005	.005
165	.002	.002	.002
180	.001	.001	.001
Initial Response	11	11	11
95 % Response	115	115	115
Flow Rate	1.5	1.5	1.5

CEM GAS TRAIN RESPONSE TIME

Elapsed Time	CO_2 Conc. (v.)	CO_2 Conc. (v.)	CO_2 Conc. (v.)	O_2 Conc. (v.)	O_2 Conc. (v.)	O_2 Conc. (v.)	CO Conc. (v.)	CO Conc. (v.)	CO Conc. (v.)
00 sec	.502	.499	.500	.498	.499	.499	.500	.498	.500
15	.491	.485	.490	.600	.592	.598	.227	.225	.222
30	.362	.370	.365	.685	.690	.692	.039	.040	.038
45	.135	.140	.137	.768	.765	.770	.015	.015	.016
60	.075	.078	.075	.810	.811	.813	.006	.007	.006
75	.039	.035	.038	.821	.822	.821	.002	.002	.002
90	.020	.018	.020	.828	.829	.826	.000	.000	.000
105	.014	.012	.014	.830	.830	.830			
120	.007	.005	.006						
135	.004	.003	.002						
150	.002	.001	.001						
165	.001	.0	.0						
180	.0								
Initial Response	14	14	14	9	9	9	6	6	6
95 % Response	85	85	85	60	60	60	37	38	37
Flow Rate	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5

ORSAT ANALYSIS DATA SHEET DATE : 5-16-2006

Gas	1	2	3	AVE	CONC	TANK ID
CO_2	0	0	0	0	N_2	168TAC-3-A
O_2	0	0	0	0	N_2	
CO	0	0	0	0	N_2	
CO_2					12.5	CC-41627
O_2					12.3	New Tank
CO					4.99	11-1-05 1 Year
CO_2	21.2	21.2	21.2	21.2	21.23	CC55904
O_2	21.1	21.1	21.1	21.1	21.10	
CO	8.6	8.6	8.6	8.6	8.60	
CO_2	6.3	6.2	6.2	6.23	6.22	CC-12731
O_2	6.3	6.3	6.2	6.27	6.25	
CO	2.0	2.0	2.0	2.0	1.98	
CO_2						
O_2						
CO						

CO_2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Date: 7-28-2006

Analyzer: Make: HORIBA Model: PIR 2000 SN: 407069

Calibration by: C. Wadlington

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter

BP: 30.10 Instrument ID: PRINCO

Temp: 83 Instrument ID: TR

Cylinders:

1. # 168TAC 3-A Concentration: 00.00 % CO_2 Cyl. Press.: 1150 PSI
   Certified by: AIR LIQUIDE Date: 04-19-04
2. # CC-41627 Concentration: 12.50 % CO_2 Cyl. Press.: 975 PSI
   Certified by: AIR LIQUIDE Date: 11-1-05
3. # CC55904 Concentration: 21.23 % CO_2 Cyl. Press.: 400 PSI
   Certified by: AIR LIQUIDE Date: 02-14-00
4. # CC-12731 Concentration: 6.22 % CO_2 Cyl. Press.: 1360 PSI
   Certified by: AIR LIQUIDE Date: 03-13-03

Analyzer: **Calibrated Range:** 0-25.0 % **Output:** 0-1.0 V.
Flow: 1.5 SCFH **Measured by:** Rotameter

Calibration Results

Point #	CYL. #	% CO2	EXPECTED METER	EXPECTED DVM	ACTUAL METER	ACTUAL DVM	ADJ. METER	ADJ. DVM
1	1	0.00	00.0	.000	0.0	-.003	0.0	.000
2	2	12.50	50.0	.500	49.6	.496	50.0	.500
3	3	21.23	84.9	.849	85.0	.850		
4	4	6.22	24.9	.249	24.8	.248		
5	1	0.00	00.0	.000	00.0	.000		

.5 = 12.497

CO_2 Linear Regression Results:

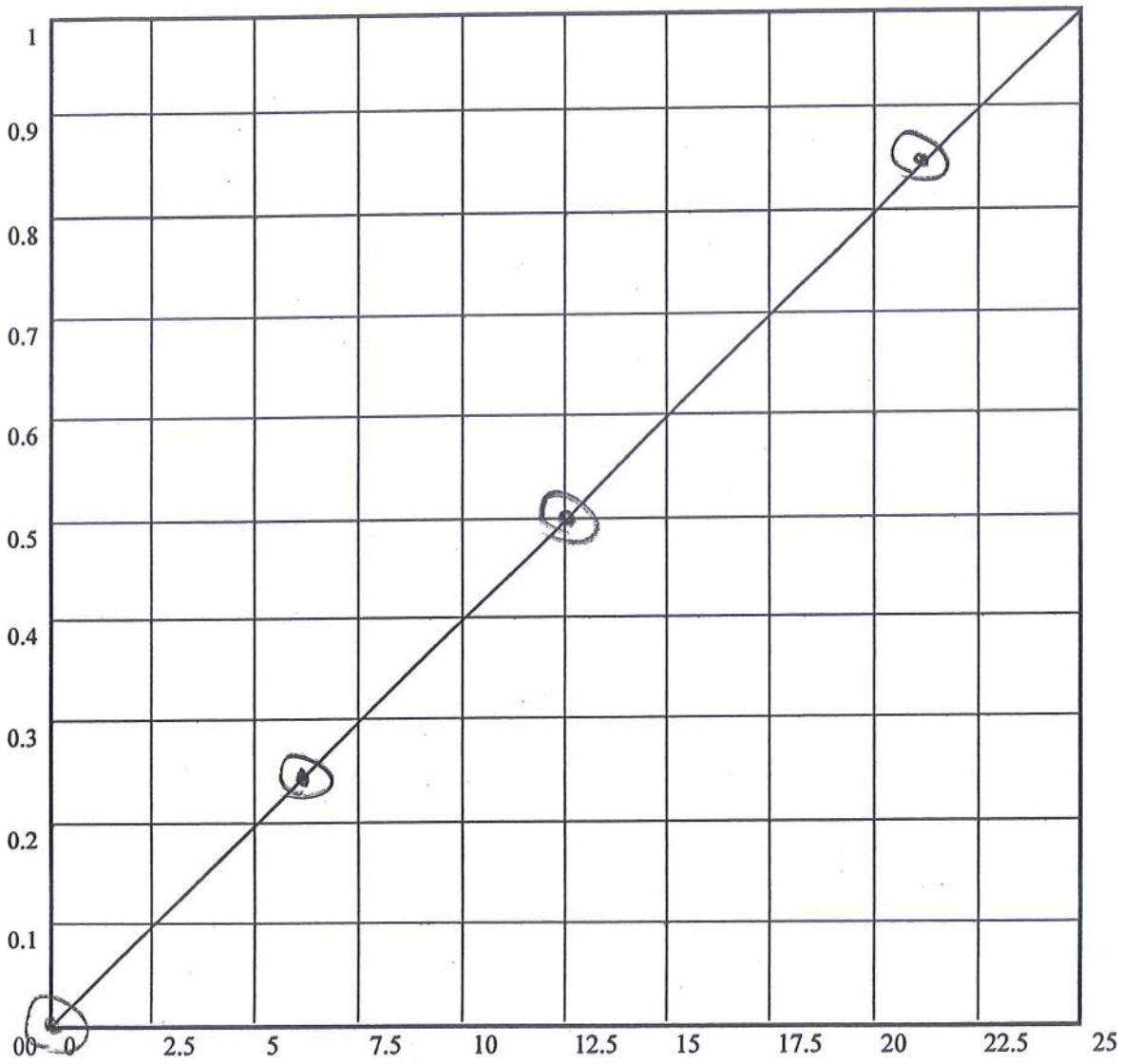
Y = MX +B

Slope (M) = -.0004862

Y Intercept (B) = .0400487

Correlation Coefficient (r) = .9999991

r^2 = .9999982

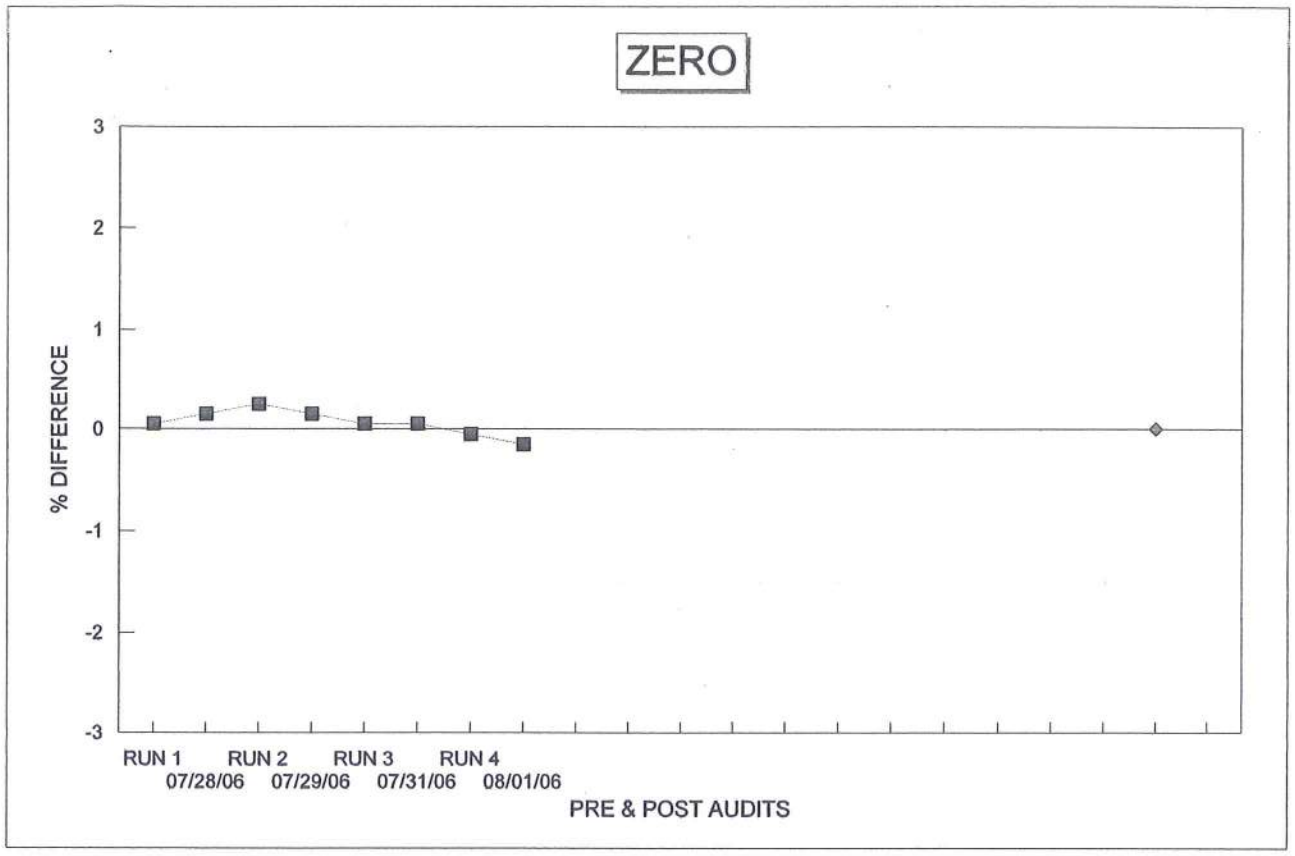


EPA Span Value = ± 2.0% of 25% CO_2 = ± .5%

Cal Volts = Cal Volt Conc - Std Conc = ± Conc Diff = ± Δ %

HIGH VOLTS .850 = 21.25 - 21.23 = .020 = .080

LOW VOLTS .248 = 6.20 - 6.22 = -.020 = -.080


ZERO
3
2
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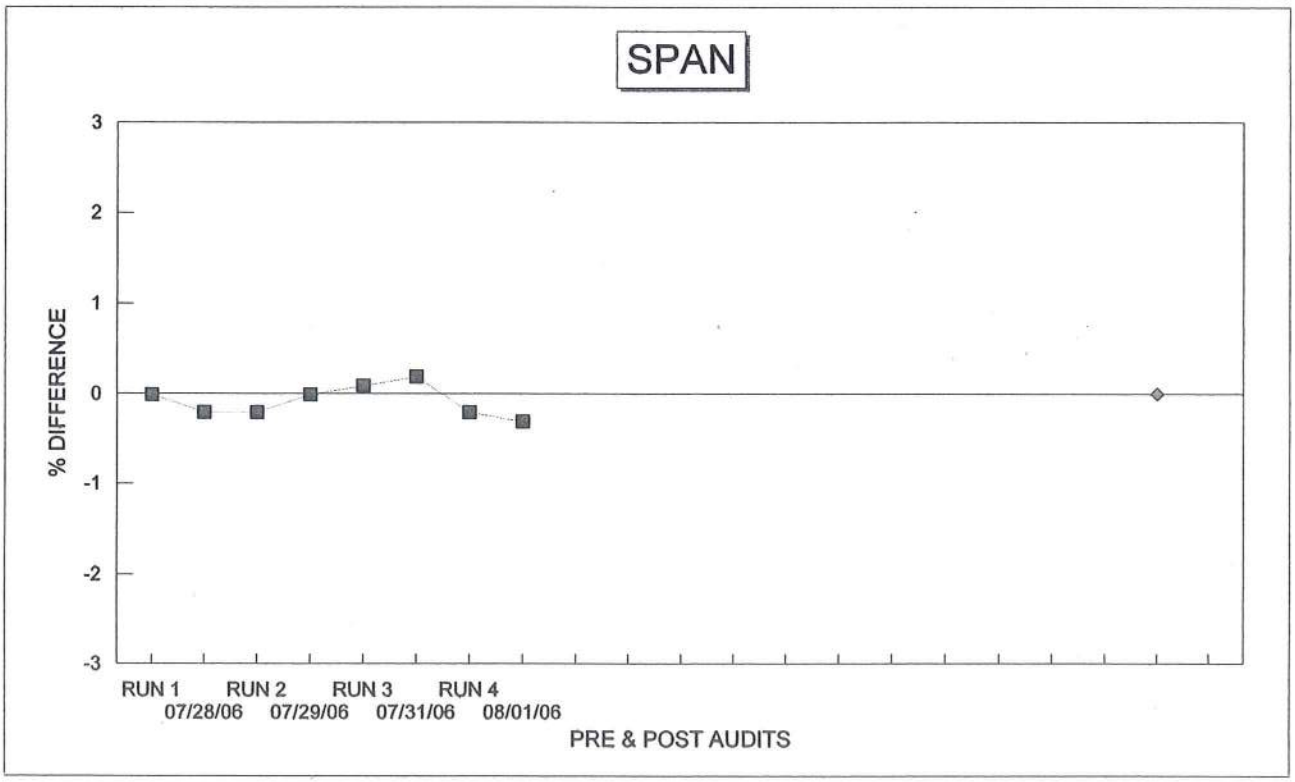
-1
-2
-3
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS


SPAN
3
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-1
-2
-3
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS

O_2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Date: 7-28-2006

Analyzer: Make: TELEDYNE Model: 320A SN: 37400

Calibration by: C. Wadmyer

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter

BP: 30.10 Instrument ID: PRINCO

Temp: 83 Instrument ID: TR

Cylinders:

1. # 168TAC 3-A Concentration: 00.00 % O_2 Cyl. Press.: 1150 PSI
   Certified by: AIR LIQUIDE Date: 04-19-04
2. # CC-41627 Concentration: 12.50 % O_2 Cyl. Press.: 975 PSI
   Certified by: AIR LIQUIDE Date: 11-1-05
3. # CC55904 Concentration: 21.10 % O_2 Cyl. Press.: 400 PSI
   Certified by: AIR LIQUIDE Date: 02-14-00
4. # CC-12731 Concentration: 6.25 % O_2 Cyl. Press.: 1360 PSI
   Certified by: AIR LIQUIDE Date: 03-13-03

Analyzer: **Calibrated Range:** 0-25.0 % **Output:** 0-1.0 V.
Flow: 1.5 SCFH **Measured by:** Rotameter

Calibration Results

Point #	CYL. #	% O2	EXPECTED METER	EXPECTED DVM	ACTUAL METER	ACTUAL DVM	ADJ. METER	ADJ. DVM
1	1	0.00	00.0	.000	0.0	.000	0.0	.000
2	2	12.50	12.50	.500	12.4	.497	12.5	.500
3	3	21.10	21.10	.844	21.1	.846		
4	4	6.25	6.25	.250	6.3	.252		
5	1	0.00	00.0	.000	00.0	.000		

.5 = 12.471

O_2 Linear Regression Results:

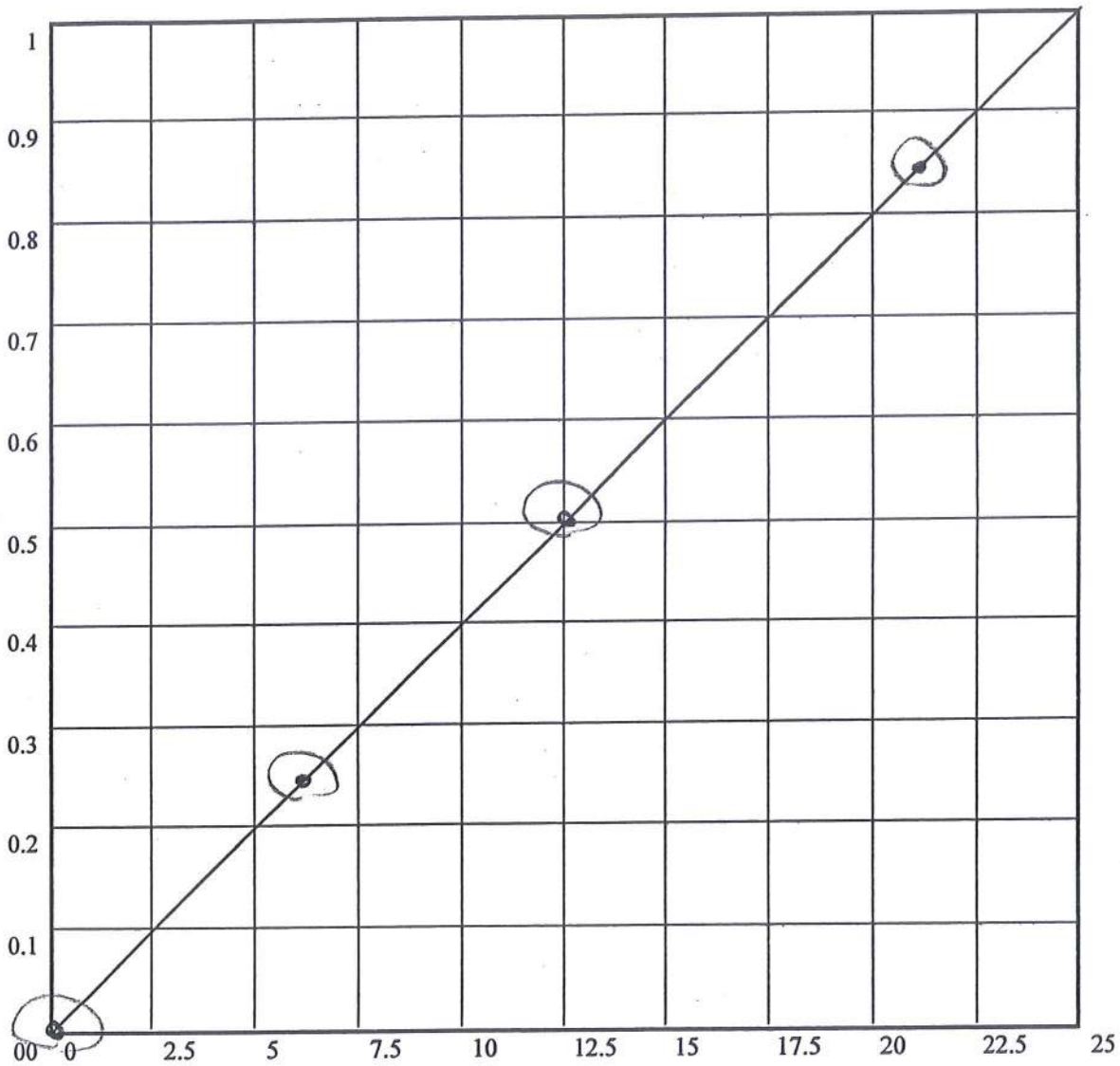
Y = MX +B

Slope (M) = .0003925

Y Intercept (B) = .0400610

Correlation Coefficient (r) = .999960

r^2 = .9999921

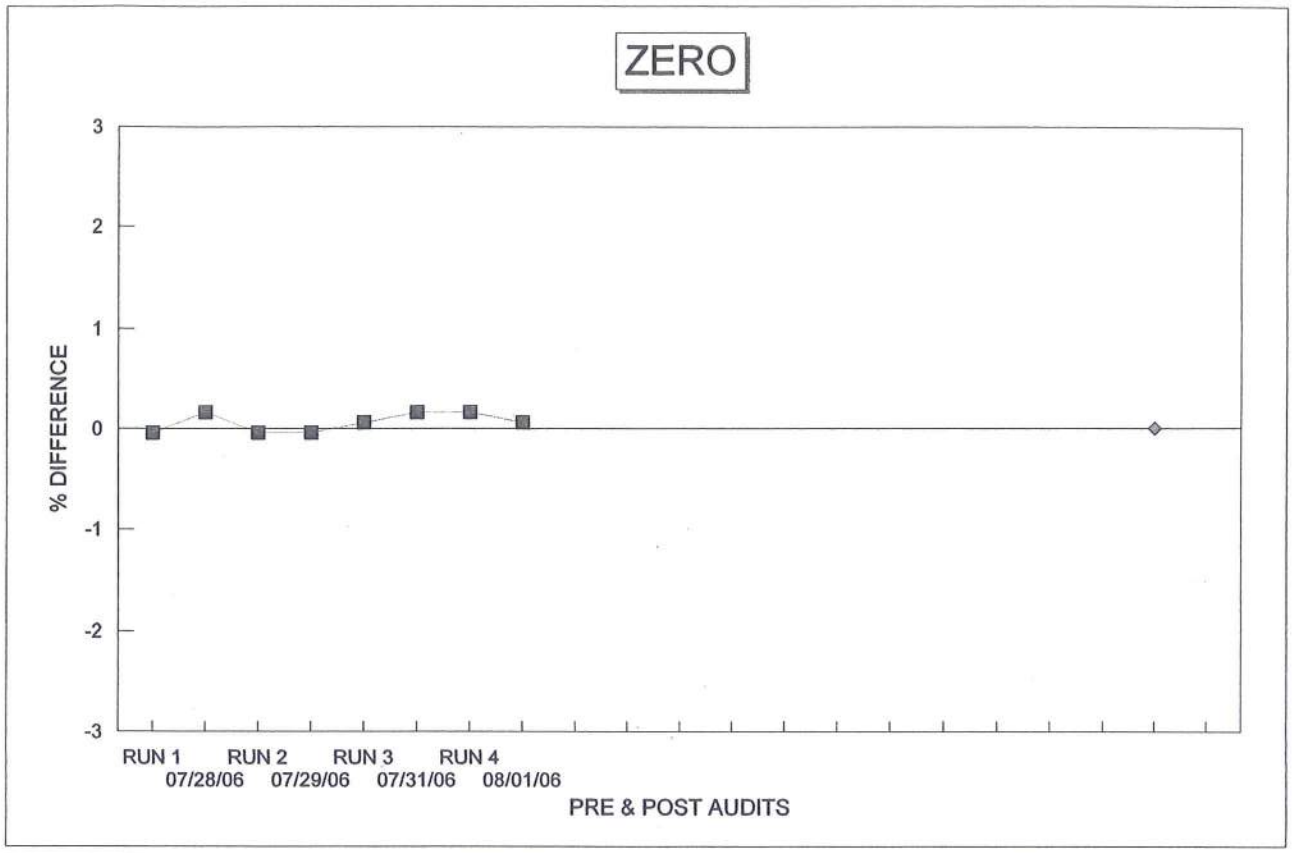


EPA Span Value = ± 2.0% of 25% O_2 = ± .5%

Cal Volts = Cal Volt Conc - Std Conc = ± Conc Diff = ± Δ %

HIGH VOLTS .846 = 21.15 - 21.1 = .050 = .200

LOW VOLTS .252 = 6.30 - 6.25 = .050 = .200


ZERO
3
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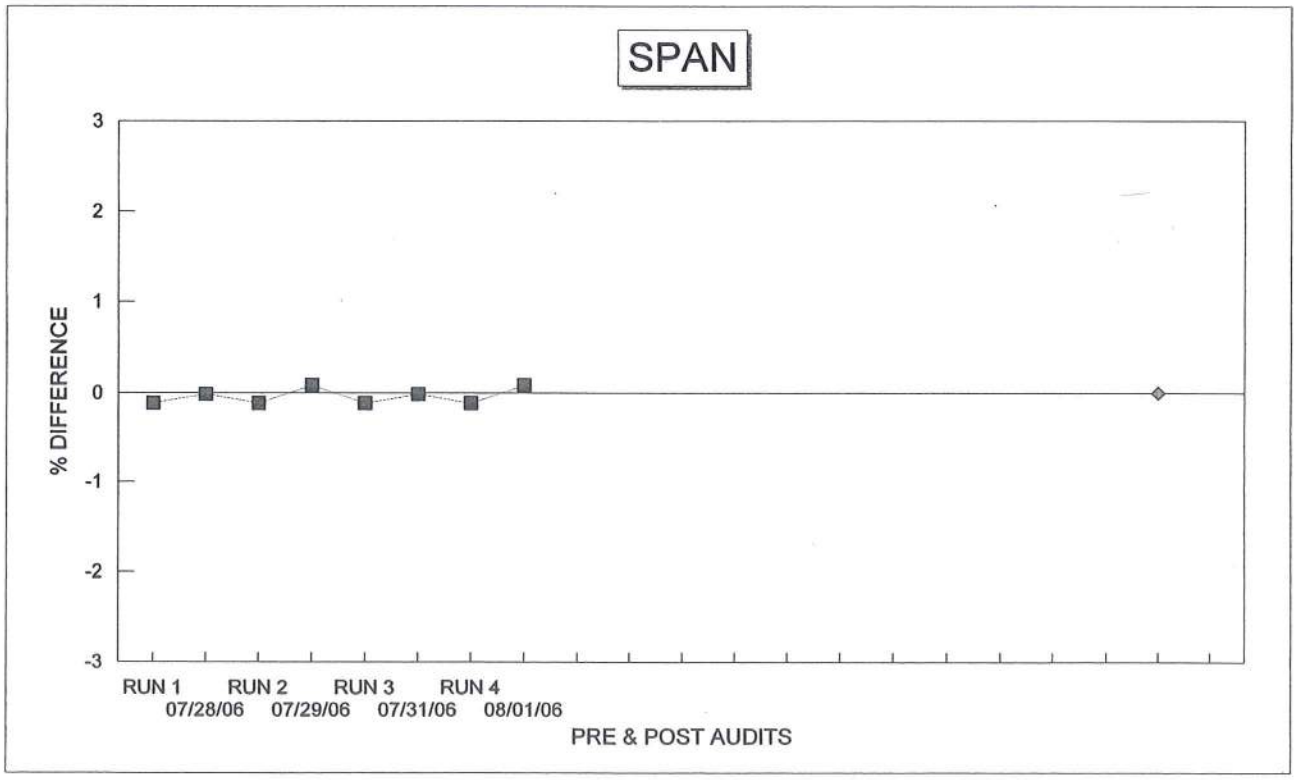
-1
-2
-3
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS


SPAN
3
2
1
0
-1
-2
-3
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS

CO ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Date: 7-28-2006

Analyzer: Make: HORIBA Model: PIR 2000 SN: 408005

Calibration by: C. Wilmot

Cal Gas Flow: 1.5 SCFH

Measured by: Rotameter

BP: 30.10

Instrument ID: PRINCO

Temp: 83

Instrument ID: TR

Cylinders:

1. # 168TAC 3-A Concentration: 00.00 % CO Cyl. Press.: 1150 PSI
   Certified by: AIR LIQUIDE Date: 04-19-04
2. # CC-41627 Concentration: 4.99 % CO Cyl. Press.: 975 PSI
   Certified by: AIR LIQUIDE Date: 11-1-05
3. # CC55904 Concentration: 8.60 % CO Cyl. Press.: 400 PSI
   Certified by: AIR LIQUIDE Date: 02-14-00
4. # CC-12731 Concentration: 1.98 % CO Cyl. Press.: 1360 PSI
   Certified by: AIR LIQUIDE Date: 03-13-03

Analyzer: **Calibrated Range:** 0-10.0 % **Output:** 0-1.0 V.
Flow: 1.5 SCFH **Measured by:** Rotameter

Calibration Results

Point #	CYL. #	% CO	EXPECTED METER	EXPECTED DVM	ACTUAL METER	ACTUAL DVM	ADJ. METER	ADJ. DVM
1	1	0.00	00.0	.000	00.1	.001	0.0	.000
2	2	4.99	49.9	.499	51.2	.512	49.9	.499
3	3	8.60	86.0	.860	85.6	.856		
4	4	1.98	19.8	.198	20.0	.200		
5	1	0.00	00.0	.000	00.0	.000		

.5 = 5.011

CO Linear Regression Results:

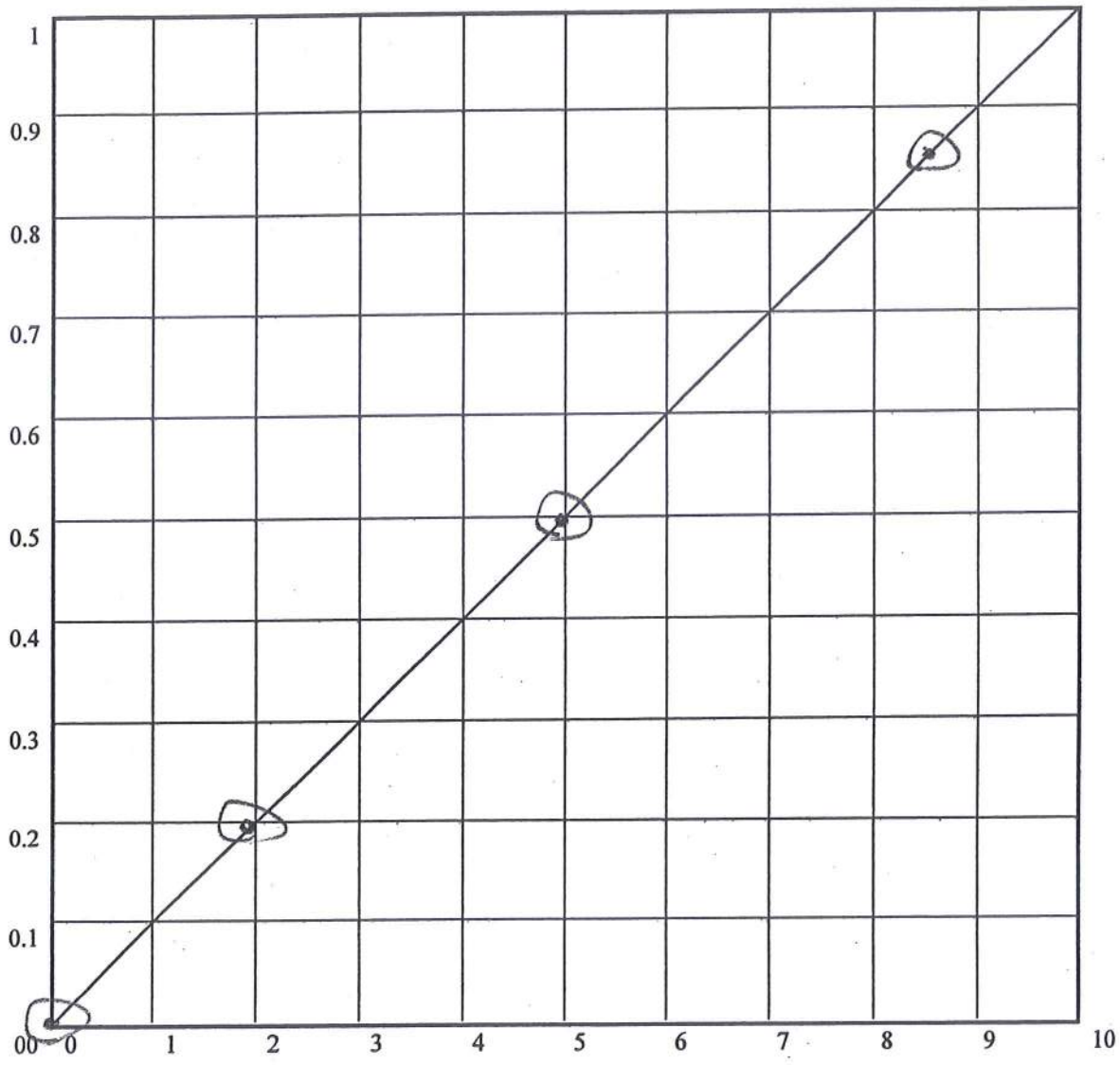
Y = MX +B

Slope (M) = .0015910

Y Intercept (B) = .0994628

Correlation Coefficient (r) = .9999918

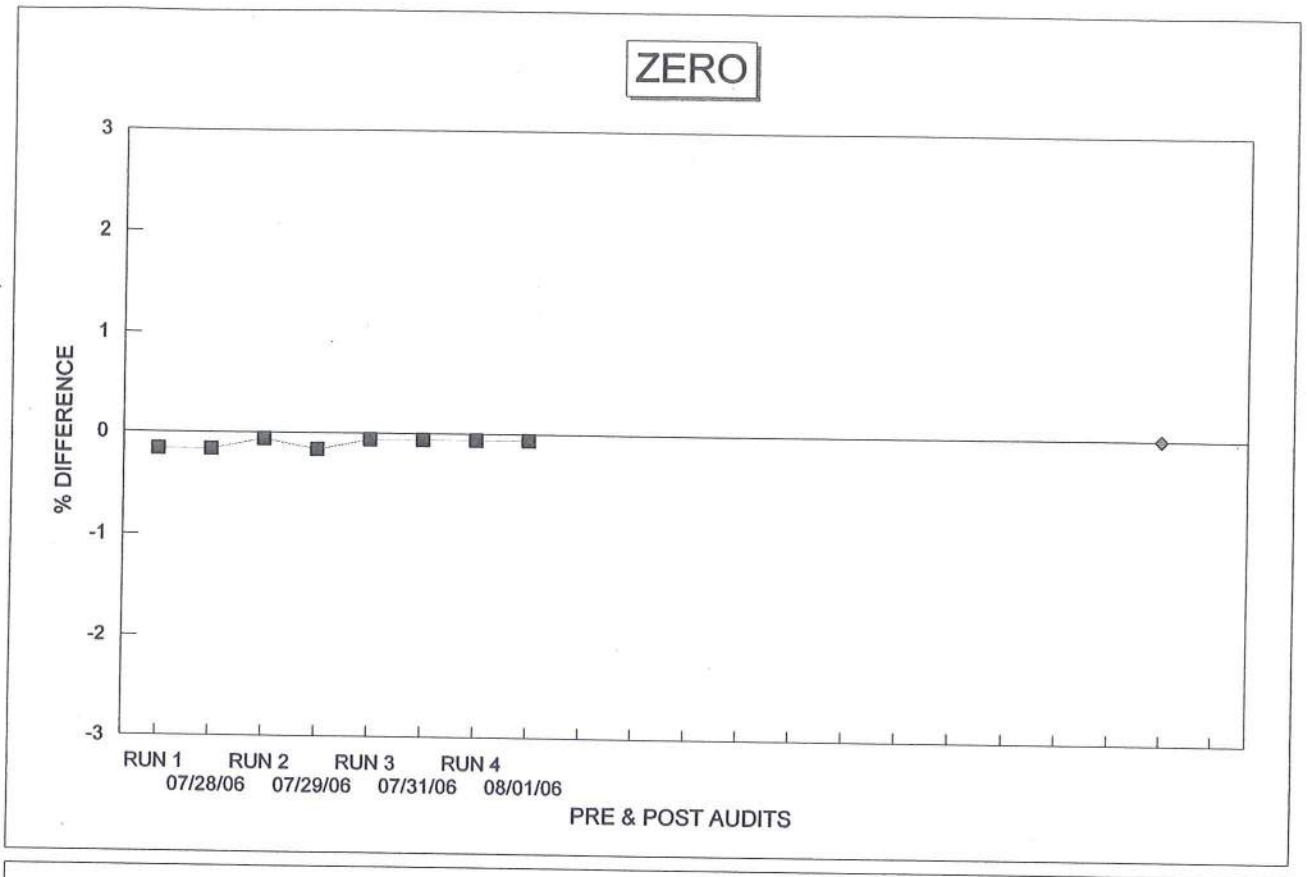
r^2 = .9999836



EPA Span Value = ± 2.0% of 10% CO = ± .2%

Cal Volts = Cal Volt Conc - Std Conc = ± Conc Diff = ± Δ %

HIGH VOLTS	.856 =	8.56 -	8.60 =	-.040 =	-.400
LOW VOLTS	.200 =	2.00 -	1.98 =	.020 =	.200


ZERO
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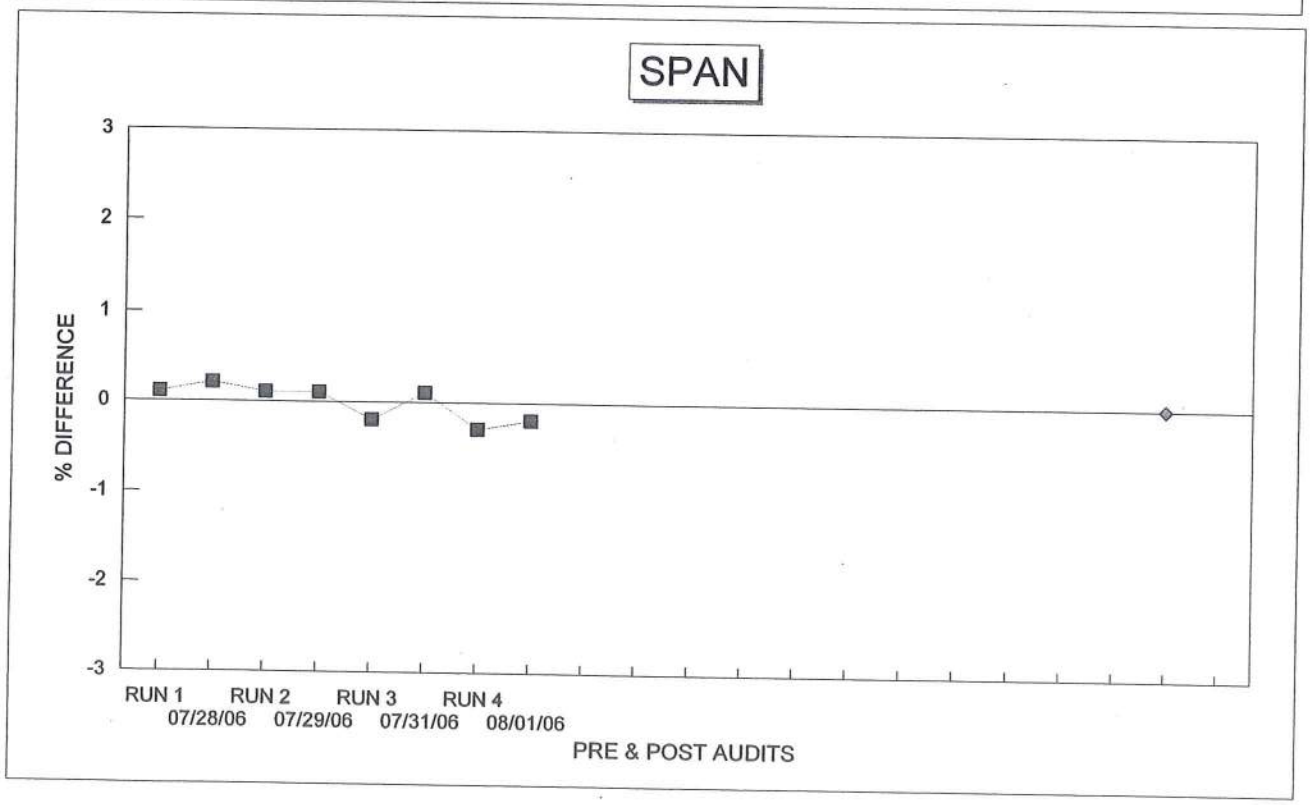
-3
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS


SPAN
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-1
-2
-3
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS

SO_2 ANALYZER
MULTIPOINT CALIBRATION REPORT FORM

Date: 7-28-2006

Analyzer: Make: HORIBA Model: PIR 2000 SN: 403019

Calibration by: C. Warrington

Cal Gas Flow: 1.5 SCFH Measured by: Rotameter

BP: 30.10 Instrument ID: PRINCO

Temp: 83 Instrument ID: TR

Cylinders:

1. # 168TAC 3A Concentration: 00.00 % SO_2 Cyl. Press.: 1150 PSI
   Certified by: AIR LIQUIDE Date: 04-19-04
2. # CC62184 Concentration: 1290 % SO_2 Cyl. Press.: 400 PSI
   Certified by: AIR LIQUIDE Date: 01-29-01
3. # ALMO 49127 Concentration: 1770 % SO_2 Cyl. Press.: 810 PSI
   Certified by: SCOTT SPECIALTY GASES Date: 05-15-97
4. # ALMO 52285 Concentration: 506 % SO_2 Cyl. Press.: 720 PSI
   Certified by: SCOTT SPECIALTY GASES Date: 05-15-97

Analyzer: **Calibrated Range:** 0-2500 PPM **Output:** 0-1.0 V.
Flow: 1.5 SCFH **Measured by:** Rotameter

Calibration Results

Point #	CYL. #	PPM SO2	EXPECTED		ACTUAL		ADJ.	
			METER	DVM	METER	DVM	METER	DVM
1	1	0.00	00.0	.000	0.0	-.001	0.0	.000
2	2	1290	51.6	.516	52.2	.522	51.6	.516
3	3	1770	70.8	.708	71.1	.711		
4	4	506	20.2	.202	19.6	.196		
5	1	0.00	00.0	.000	00.0	.000		

.5 = 1249.648

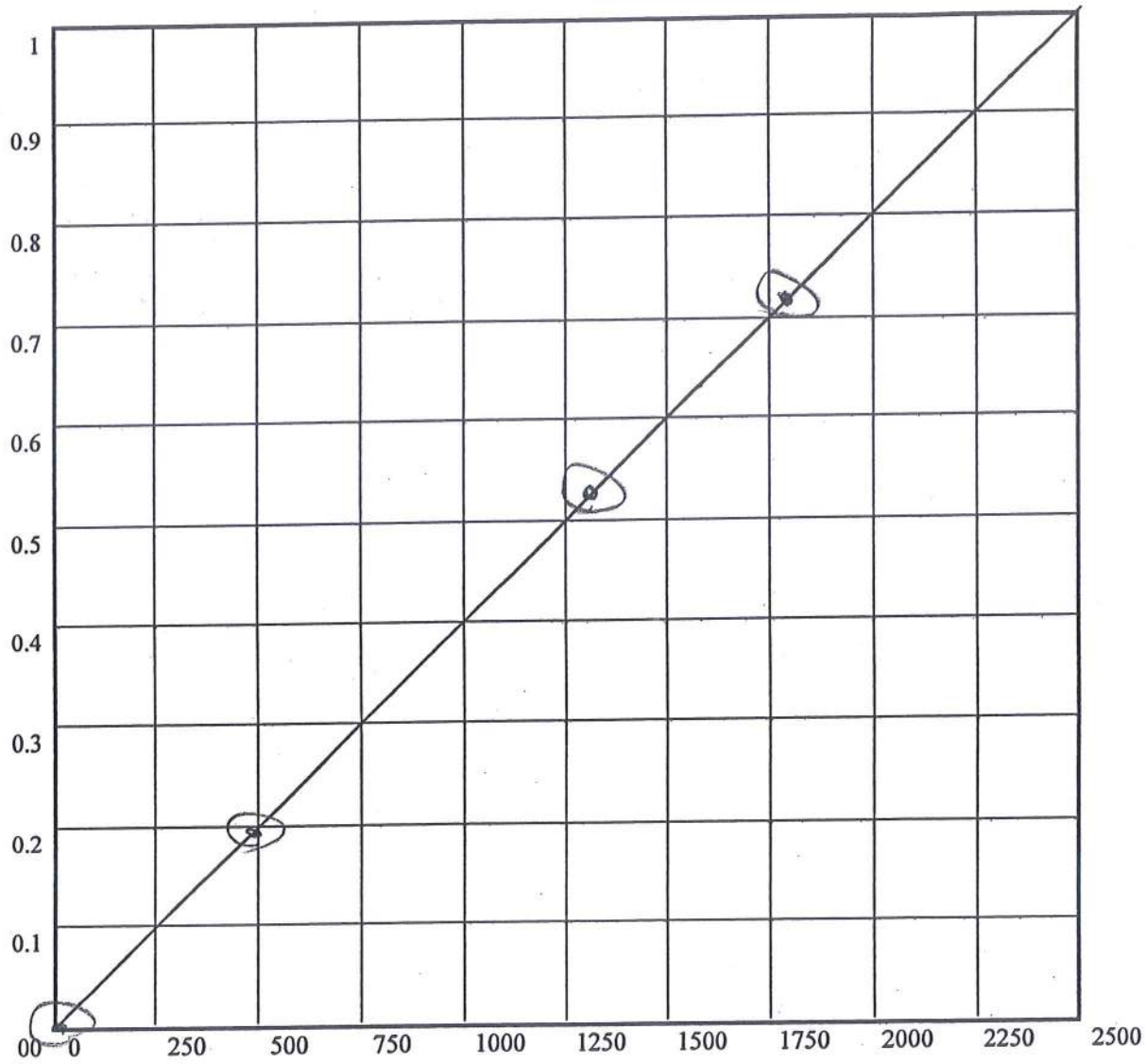
SO_2 Linear Regression Results:

Y = MX +B
Slope (M) = -,0032775

Y Intercept (B) = ,0004627

Correlation Coefficient(r) = ,9999454

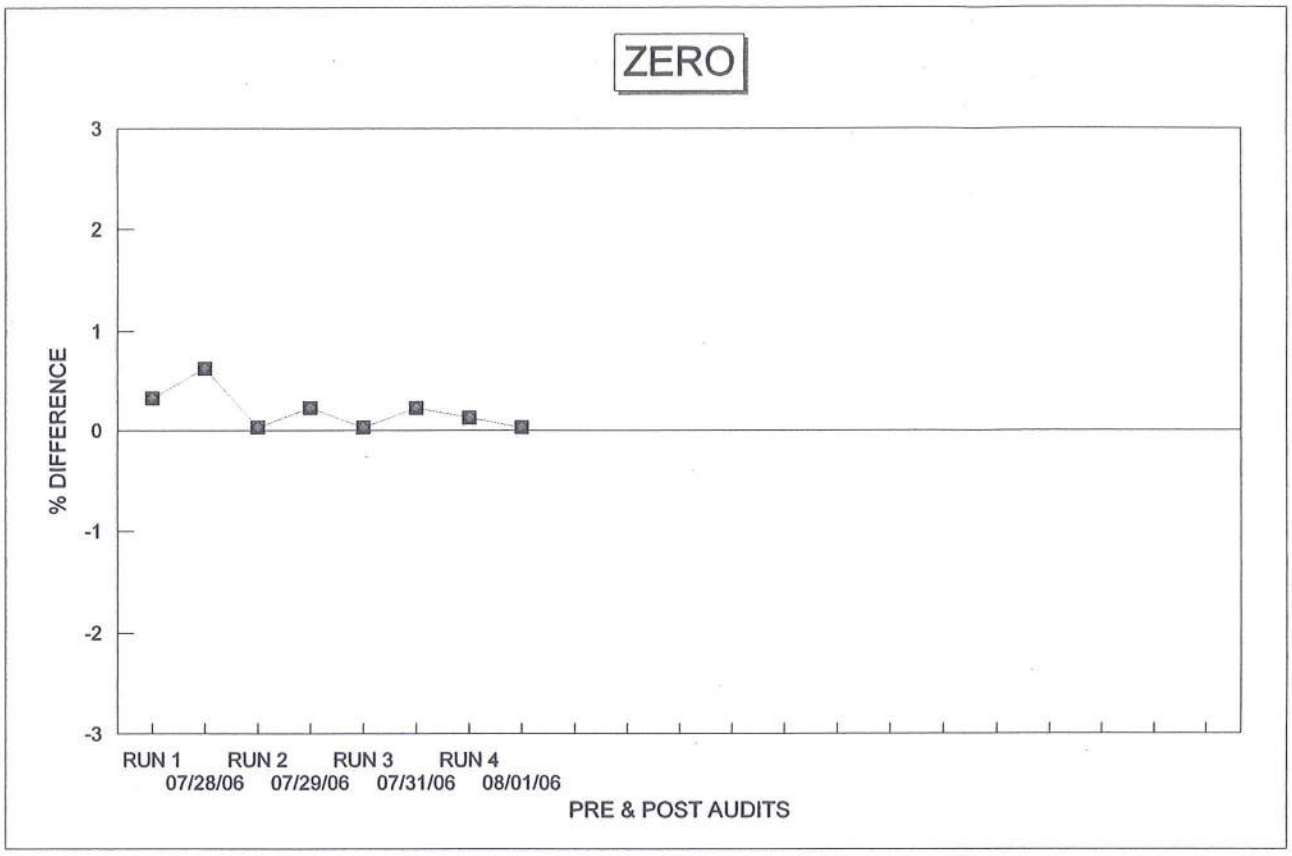
r^2 = ,9998909



EPA Span Value = ± 2.0% of 2500 PPM SO_2 = ± 50 PPM
Cal Volts = Cal Volt Conc - Std Conc = ± Conc Diff = ± Δ %

HIGH VOLTS ,711 = 1777.5 - 1770.0 = 7.500 = ,300

LOW VOLTS ,196 = 490.0 - 506.0 = -16.000 = -,040


ZERO
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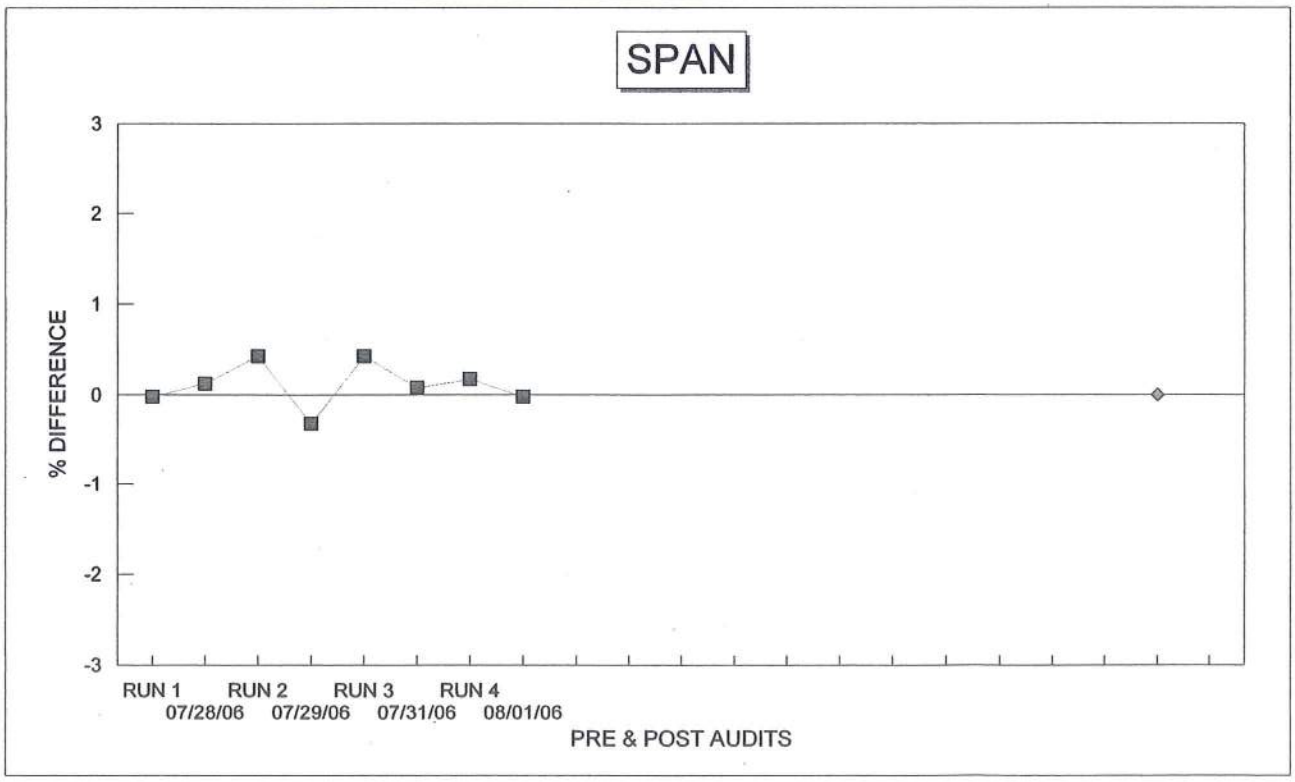
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS


SPAN
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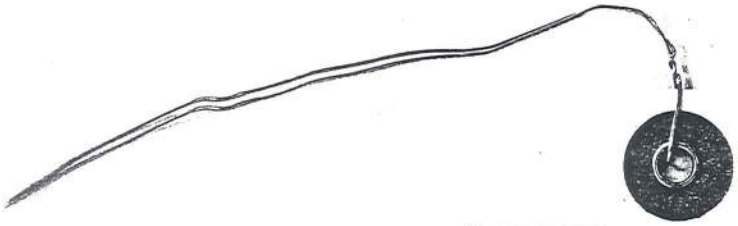
-1
-2
-3
% DIFFERENCE
RUN 1
07/28/06
RUN 2
07/29/06
RUN 3
07/31/06
RUN 4
08/01/06
PRE & POST AUDITS



LOW SPAN

AIR LIQUIDE

GASES FOR RESEARCH AND DEVELOPMENT

CYL # CC-12731 CGA 590

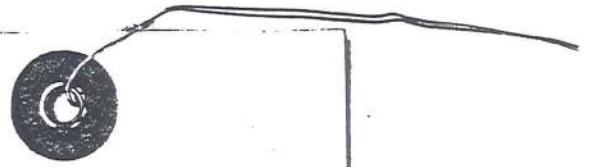
PRES 1665 VOL 130c.f

TEST # 07203 DATE 03-13-03

Analytical Method GC/paramagnetic

	Requested	Analyzed
Hydrogen		
Nitrogen	Bal.	Bal.
Argon		
Air		
Carbon Monoxide	2%.	1.98%.
Methane		
Oxygen	6.25%.	6.25%.
Helium		
Carbon Dioxide	6.25%.	6.22%.

SIGNED

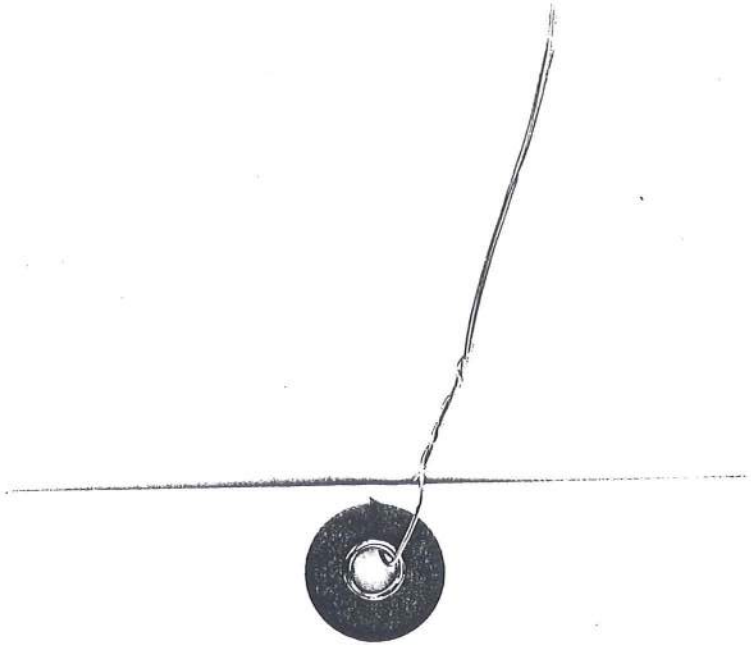


AIR LIQUIDE

1451 THORNE RD.
TACOMA, WA 98421
TEL: (253) 383-3637

THE ONLY LIABILITY OF THIS COMPANY FOR GAS WHICH FAILS TO COMPLY WITH THE ANALYSIS SHALL BE REPLACEMENT THEREOF BY THE COMPANY WITHOUT EXTRA COST.

DO NOT REMOVE THIS TAG



AIR LIQUIDE

GASES FOR RESEARCH AND DEVELOPMENT

CYL # CC55904 CGA 590

PRES 1650 VOL 150 cf

TEST # 04500 DATE 02-14-00

Analytical Method GC / Paramagnetic

	Requested	Analyzed
Hydrogen		
Nitrogen	Bal.	Bal.
Argon		
Air		
Carbon Monoxide	8.5%	8.60%
Methane		
Oxygen	21%	21.10%
Helium		
Carbon Dioxide	21%	21.23%

SIGNED

GRD-1

AIR LIQUIDE

GASES FOR RESEARCH AND DEVELOPMENT

CYL # CC-41627 CGA 590

PRES 1650 VOL 150 SCF

TEST # 30505 DATE 11-01-05

Analytical Method GC/paramagnetic

	Requested	Analyzed
Hydrogen		
Nitrogen	Bal.	Bal.
Argon		
Air		
Carbon Monoxide	5%	4.99%
Methane		
Oxygen	12.5%	12.5%
Helium		
Carbon Dioxide	12.5%	12.5%

SIGNED

AIR LIQUIDE™

1451 THORNE RD.
TACOMA, WA. 98421
TEL: (253) 383-3637

THE ONLY LIABILITY OF THIS COMPANY FOR GAS WHICH FAILS TO COMPLY WITH THE ANALYSIS SHALL BE REPLACEMENT THEREOF BY THE COMPANY WITHOUT EXTRA COST.

DO NOT REMOVE THIS TAG

Scott Specialty Gases

500 WEAVER PARK RD,LONGMONT,CO 80501 Phone: 303-442-4700 Fax: 303-772-7673

CERTIFICATE OF ANALYSIS: Interference-Free™ Multi-Component EPA Protocol Gas

Customer
ENERGY & ENV MEASUREMENT

C/O ED WADINGTON
3730 N. PELLEGRINO DR.
TUCSON,AZ 85749

Assay Laboratory

SCOTT SPECIALTY GASES
500 WEAVER PARK RD
LONGMONT,CO 80501

Project No.: 08-34135-001
P.O. No.: VERBAL

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure #G1; September, 1993.

Cylinder Number: ALM052285 Certification Date: 4/21/97 Exp. Date: 4/21/2000
Cylinder Pressure***: 1996 PSIG

COMPONENT	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY**
SULFUR DIOXIDE *	506 PPM	+/- 1% NIST Traceable
NITROGEN	BALANCE	

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes. Product certified as +/- 1% analytical accuracy is directly traceable to NIST standards.

* This Protocol has been certified using corrected NIST SO2 standard values, per EPA guidance dated 7/24/96 and will not correlate with uncorrected Protocols.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1661	9/27/98	ALM059505	488.5 PPM	SO2/N2

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	LAST DATE CALIBRATED	ANALYTICAL PRINCIPLE
FTIR System/8220/AAB9400251	03/20/97	Scott Enhanced FTIR

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

SULFUR DIOXIDE *

First Triad Analysis			Second Triad Analysis			Calibration Curve	
Date: 04/14/97	Response Unit: PPM		Date: 04/21/97	Response Unit: PPM		Concentration = A + Bx + Cx2 + Dx3 + Ex4	
Z1 = 0.3847	R1 = 487.72	T1 = 505.77	Z1 = 0.3241	R1 = 488.29	T1 = 505.43	r = 0.999990	
R2 = 488.79	Z2 = 1.8201	T2 = 505.89	R2 = 488.83	Z2 = 1.8098	T2 = 505.75	Constants:	A = 0.000000
Z3 = 1.8428	T3 = 505.78	R3 = 488.99	Z3 = 0.8340	T3 = 505.74	R3 = 488.69	B = 1.000000	C = 0.000000
Avg. Concentration:	505.8 PPM		Avg. Concentration:	505.8 PPM		D = 0.000000	E = 0.000000

Special Notes:

ANALYST: Devon VonFeldt
Devon VonFeldt

SO2 concentration analysis
05/16/06

Vm(std)	1.500			
mcf	1.004		dscf=	1.500
Hg	30.11			
DH	0.12			
temp	70	529	ppm =	513
ml BA ++	179			
Normality	0.0101			

Run1	504
Run 2	493
Run3	513
avg.	503

Tank I.D. # ALMO52285

AIR LIQUIDE™

8832 DICE ROAD, SANTA FE SPRINGS, CALIFORNIA 90670 (562) 945-1383

CERTIFIED ISO - 9002 INTERTEK CERTIFICATION

CERTIFICATE of ANALYSIS

EPA Protocol Gases

Cyl. Number:	Cyl. Pressure:*	Lot Number:
CC 62184	2000PSIG	SFS34489
Assay Date:	**Expiration Date:**	**Document Number:**
01/29/01	01/29/04	7638112
Customer:	**P.O. Number:**	**Item Number:**
AIR LIQUIDE TACOMA, WA	LOKKEE	

*Mixture is valid only to 150 psig

COMPONENT Name	REQUESTED Concentration	ASSAY Concentration
Sulfur Dioxide	1250 ppm	1290 ± 20 ppm
Nitrogen	Balance	Balance

EPA Protocol
Section No. 2.2, Procedure . G-1

Analyst: Thuan Tran
Approved by: John Oliveri

REFERENCE STANDARD EMPLOYED FOR ANALYSIS

Concentration	Component	Balance	Cyl. No.	Batch	Exp. Date	Sample No.	Type
1540 ± 10 ppm	Sulfur Dioxide	Nitrogen	CC 62136	L99-029	12/02/01	GL	GMIS

Sulfur Dioxide
GAS ANALYZER EMPLOYED

Manufacturer:	Horiba
Model Number:	CMA-331A
Serial Number:	56674503
MPR Last Calibrated:	01/12/01
Analytical Principle:	NDIR

ANALYSIS SUMMARY

	01/22/01 Triad 1	01/22/01 Triad 2	01/22/01 Triad 3	Sulfur Dioxide Units
Zero	0	0	0	Vdc
Reference	153	153	153	Vdc
Candidate	127	128	128	Vdc
Result	1278	1288	1288	ppm
Evaluation	VALID	VALID	VALID	

MEAN ANALYTICAL RESULT: 1285 ppm

	01/29/01 Triad 4	01/29/01 Triad 5	01/29/01 Triad 6	Sulfur Dioxide Units
Zero	0	0	0	Vdc
Reference	153	153	153	Vdc
Candidate	128	128	128	Vdc
Result	1288	1288	1288	ppm
Evaluation	VALID	VALID	VALID	

MEAN ANALYTICAL RESULT: 1288 ppm

Analyst:	Approved by:
Thuan Tran	John Oliveri

SO2 concentration analysis
05/16/06

Vm(std)	1.500			
mcf	1.004		dscf=	1.500
Hg	30.11			
DH	0.12			
temp	70	530	ppm =	1294
ml BA ++	452			
Normality	0.0101			

Run1	1289
Run 2	1303
Run3	1292
avg.	1295

Tank I.D. # CC62184

Scott Specialty Gases

500 WEAVER PARK RD,LONGMONT,CO 80501 Phone: 303-442-4700 Fax: 303-772-7673

CERTIFICATE OF ANALYSIS: EPA PROTOCOL GAS

Customer
ENERGY & ENV MEASUREMENT

C/O ED WADINGTON
3730 N. PELLEGRINO DR.
TUCSON,AZ 85749

Assay Laboratory

SCOTT SPECIALTY GASES
500 WEAVER PARK RD
LONGMONT,CO 80501

Project No.: 08-34135-003
P.O. No.: VERBAL

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure #G1; September, 1993.

Cylinder Number: ALM049127 **Certification Date:** 4/21/97 **Exp. Date:** 4/21/2000
Cylinder Pressure*:** 1860 PSIG

COMPONENT	CERTIFIED CONCENTRATION		ANALYTICAL ACCURACY**
SULFUR DIOXIDE *	1,770	PPM	+/- 1% NIST TRACEABLE
NITROGEN		BALANCE	

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is inclusive of usual known error sources which at least include precision of the measurement processes. Product certified as +/- 1% analytical accuracy is directly traceable to NIST standards.

* This Protocol has been certified using corrected NIST SO2 standard values, per EPA guidance dated 7/24/96 and will not correlate with uncorrected Protocols.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM-R-1696	7/03/98	ALM057797	3131. PPM	SULFUR DIOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	LAST DATE CALIBRATED	ANALYTICAL PRINCIPLE
FTIR System/8220/AAB9400251	03/20/97	Scott Enhanced FTIR

ANALYZER READINGS

(Z = Zero Gas R = Reference Gas T = Test Gas r = Correlation Coefficient)

First Triad Analysis

SULFUR DIOXIDE *

Date: 04/14/97	Response Unit: PPM	
Z1 = 0.7210	R1 = 3127.7	T1 = 1767.1
R2 = 3131.7	Z2 = 4.6770	T2 = 1768.1
Z3 = 4.6770	T3 = 1768.1	R3 = 3133.7
Avg. Concentration:	1768.	PPM

Second Triad Analysis

Date: 04/21/97	Response Unit: PPM	
Z1 = 0.4020	R1 = 3125.8	T1 = 1770.2
R2 = 3132.3	Z2 = 6.6540	T2 = 1769.3
Z3 = 4.9410	T3 = 1770.9	R3 = 3134.9
Avg. Concentration:	1770.	PPM

Calibration Curve

Concentration = A + Bx + Cx2 + Dx3 + Ex4	
r = 0.999990	1696
Constants:	A = 0.00000
B = 1.00000	C = 0.00000
D = 0.00000	E = 0.00000

Special Notes:

ANALYST: Devon VonFeldt
DEVON VONFELDT

SO2 concentration analysis
05/16/06

Vm(std)	1.500			
mcf	1.004		dscf=	1.500
Hg	29.85			
DH	0.12			
temp	70	530	ppm =	1773
ml BA ++	619			
Normality	0.0101			

Run1	1775
Run 2	1781
Run3	1773
avg.	1776

Tank I.D. # ALMO49127

Certificate of Analysis

ANALYTICAL CONTROL LABORATORY ANALYSIS
METHYLENE CHLORIDE - OPTIMA

Catalog No. D151 July 23, 2003
Lot No. 035941

This is to certify that this lot was tested and found to comply with the specifications for this product. The following are the actual analytical results obtained:

TESTS		ACTUAL ANALYSIS
Assay		99.9%
Color		5 APHA
Description		Clear, Colorless Liquid
Free Halogens		Pass Test
Identification		Pass Test
Fluorescence Background (as Quinine Sulfate)		Not more than 1 ppb
Certified for EPA Test #1625		Pass Test
Pesticide Residue Analysis (as Heptachlor Epoxide)		Not more than 10ng/l
Density (g/ml) at 25°C		1.317 .
Optical Absorbance	At 254 nm	0.002
	At 240 nm	0.10
	At 233 nm	0.54
Refractive Index at 25°C		1.4209
Residue after Evaporation		0.4 ppm
Titratable Acid		0.00004 Meq/g.
Preservative (Amylene)		64 ppm
Water (H_2O)		0.008%

Fisher Scientific
Chemical Division
1 Reagent Lane
Fair Lawn, N.J. 07410
201-796-7100

Approved By: Edgar E. Hess

Edgar E Hess
Q.C. Laboratory Manager

Certificate of Analysis

ANALYTICAL CONTROL LABORATORY ANALYSIS
ACETONE - OPTIMA

Catalog No. A929 June 4, 2002

Lot No. 023283

This is to certify that this lot was tested and found to comply with the specifications for this product. The following are the actual analytical results obtained:

TESTS		ACTUAL ANALYSIS
Assay		99.6%
Color		5 APHA
Description		Clear, Colorless Liquid
Identification		Pass Test
Fluorescence Background (as Quinine Sulfate)		Not More Than 1 ppb
Pesticide Residue Analysis (As Heptachlor Epoxide)		Not More Than 10 ng/L
Substances Reducing Permanganate		Pass Test
Solubility in Water		Pass Test
Aldehyde (as HCHO)		0.0005%
Density (g/ml) @ 25 Degrees C		0.7849
Methanol (CH3OH)		0.03%
Isopropyl Alcohol ((CH3)2CHOH)		0.01%
Optical Absorbance	At 400 - 350 nm	0.001
	At 350 nm	0.004
	At 340 nm	0.05
	At 330 nm	0.67
Refractive Index at 25°C		1.3566
Residue after Evaporation		0.4 ppm
Titratable Acid		0.0003 Meq/g
Titratable Base		<0.0001 Meq/g
Water (H_2O)		0.3%

Approved By: Robert Dowd

Robert Dowd
Q.C. Laboratory Manager

Fisher Scientific
Chemical Division
1 Reagent Lane
Fair Lawn, N.J. 07410
201-796-7100

KEITHLEY

Keithley Instruments, Inc.
28775 Aurora Road
Cleveland, Ohio 44139
(440) 248-0400
Telefax: (440) 248-6168

Certificate of Calibration

Model 2700 **Serial No** 0872585 **Date** 13 Mar 2002

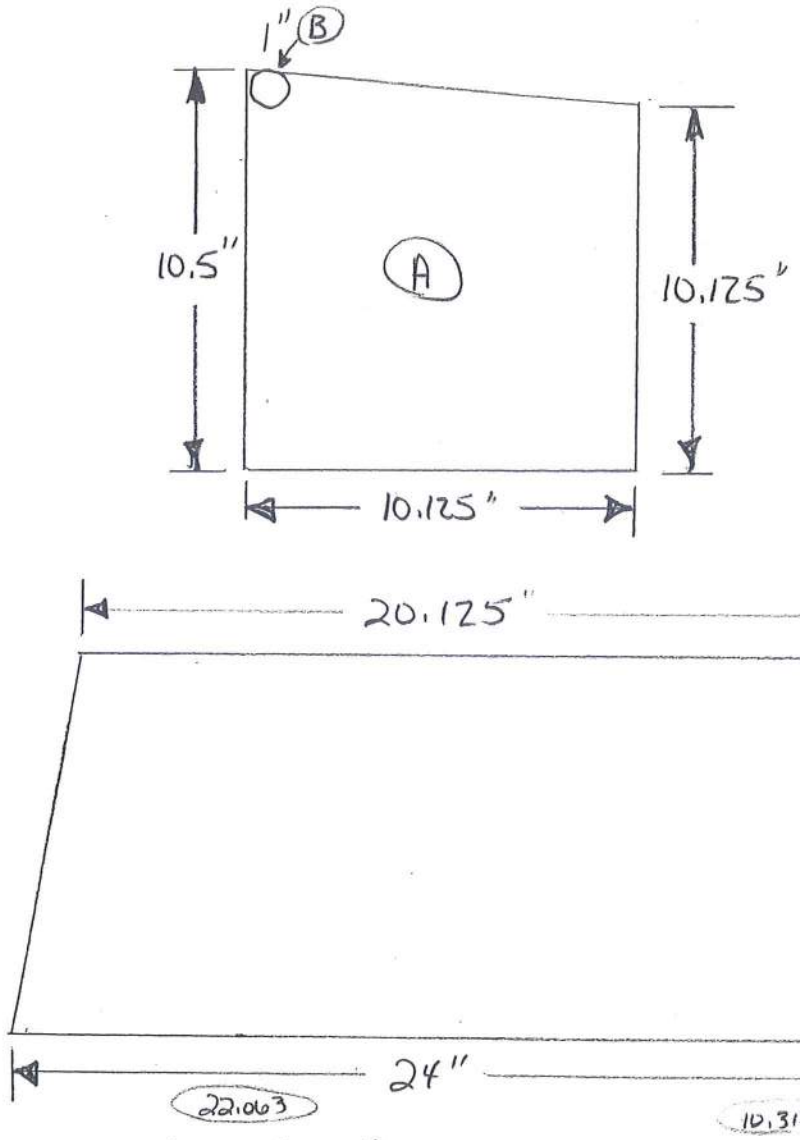
This notification serves to certify that the unit described above has been inspected and tested in accordance with specifications published by Keithley Instruments, Inc.

The accuracy and calibration of this instrument are traceable through reference standards that are compared, at planned intervals, to national standards maintained by the National Institute of Standards and Technology (NIST), by comparison to natural physical constants or self-calibrating ratio type measurements.

The measurement standards which support this calibration are calibrated on a schedule to maintain required accuracy level.

James A. Crane
Metrology Services

Firebox and Fuel Load Calculations for the Jotul C350 - Winterport



$$A = \left(\frac{20.125 + 24}{2}\right) \times 10.125 \times \left(\frac{10.5 + 10.125}{2}\right) = 2303.799$$

$$-B = 1'' \times 1' \times 24'' = -24.000$$

$$2279.799\ in^3 = 1.319\ ft^3$$

Fuel Load Range

Low	Ideal	High
8.4 ←	9.233 →	10.1

JØTUL

June 3, 2006

Mr. Chip Wadington
Lokee Testing Laboratory
13235 Prairie Circle East
Sumner, Washington 98390

Dear Mr. Wadington,

The following is a guideline for adjusting the air control of the Jøtul C350 in order to achieve burn rates in the appropriate categories. The blower speed for each test category is also indicated.

The primary air is operated by a slide type control located at the upper right front corner of the stove.

The secondary air is controlled through an opening located at the center rear bottom of the stove. Secondary air is a non-adjustable fixed opening size.

Air Control and Blower Setting

Burn Rate	Primary Air	Blower Speed / Time on
Low (Min. dry kg/hr)	1/8" Open	Low / On at 30 minutes
Med. Low (< 1.25 dry kg/hr)	3/16" open	Low / On at 30 minutes
Med. High (1.25-1.90 dry kg/hr)	1/4" open	Low / On at 30 minutes
High (Max dry kg/hr)	Max. open	High / Entire test

Air and blower setting information contained in the operation manual will be presented in a way as to be representative of the information contained above.

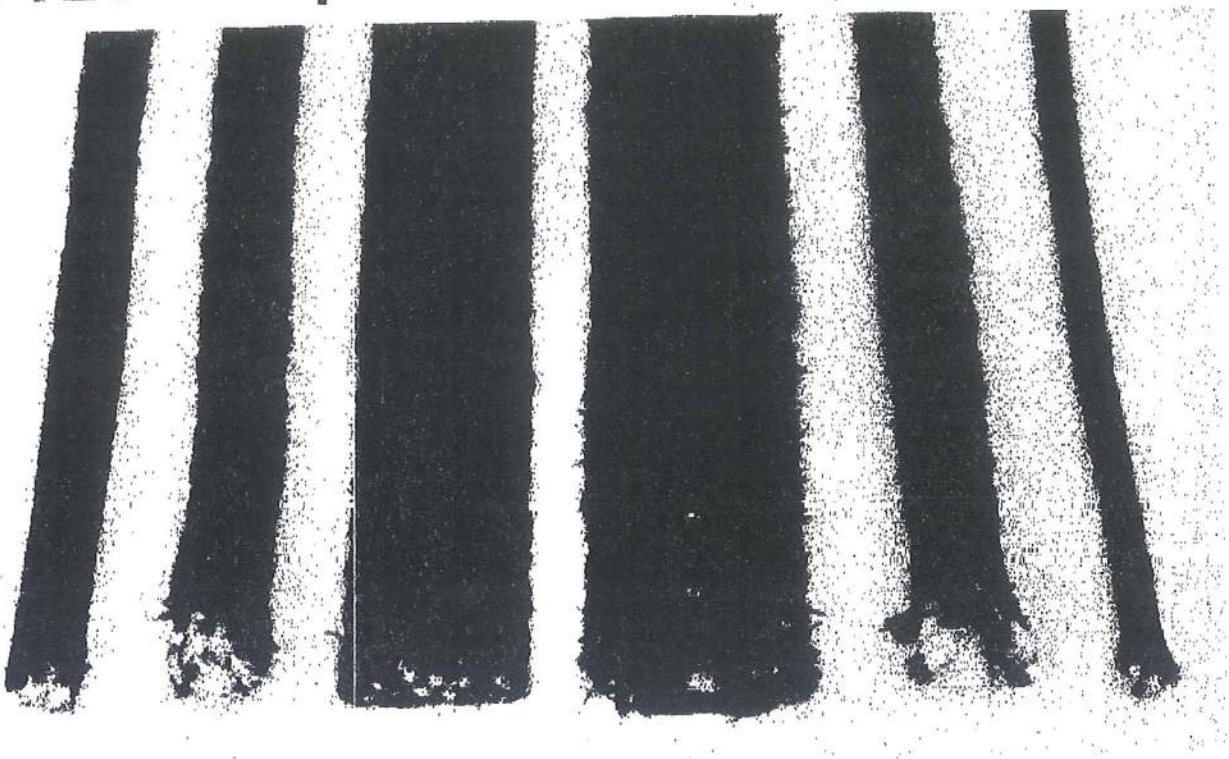
Sincerely,

Roger W. Purinton
Project Engineer
Jotul North America
55 Hutcherson Drive
Gorham, Maine 04038

Tel. (207) 797-5912
Fax (207) 772-0523

Jøtul North America
P.O. Box 1157, Portland, Maine 04104 www.jotulflame.com

FIL-TEC™ Graphite Coated Appliance Seals



Now used by leading appliance manufacturers

Fil-Tec is today's leader in developing sealing ropes and tapes for the Hearth Products industry. Our ropes in graphite black offer increased abrasion resistance and longer life. All ropes and tapes are available with pressure sensitive adhesive for ease of installation. Sizes shown below fit most appliance requirements. Other styles and sizes available (From Product Data Sheets)

Ropes

STYLE NO.	DIAMETER (mm.)	FT./CASE (meters)
LD-187	3/16" (4,8mm)	5500' (1675 M)
LD-250-2	1/4" (6,4mm)	2250' (690 M)
LD-312	5/16" (8mm)	2500 (760 M)
LD-360	11/32" (8,7mm)	1600' (490 M)
LD-375-2	3/8" (9,5mm)	1600' (490 M)
LD-500-2	1/2" (12,7mm)	1000' (305 M)
LD-625-2	5/8" (15,8mm)	800' (245 M)
LD-750-2	3/4" (19mm)	600' (180 M)
LD-1-2	1" (25,4mm)	265' (80 M)

All ropes and tapes shown on the tables above are available from stock. It's easy to buy direct from America's leading manufacturer of Hearth Appliance Seals.

Tapes

STYLE NO.	WIDTH (mm)	THICKNESS	FT./CASE (meters)
WT-187	5/8" (15,8mm)	3/16" (4,8mm)	1760' (540 M)
	3/4" (19mm)	3/16" (4,8mm)	1440' (440 M)
	1" (25,4mm)	3/16" (4,8mm)	1200' (370 M)
V-125	1/2" (12,7mm)	1/8" (3,2mm)	2800' (850 M)
	5/8" (15,8mm)	1/8" (3,2mm)	2000' (610 M)
	3/4" (19mm)	1/8" (3,2mm)	1500' (460 M)
	1" (25,4mm)	1/8" (3,2mm)	1500' (460 M)
K-187	3/8" (9,5mm)	3/16" (4,8mm)	2900' (880 M)
	5/8" (15,8mm)	3/16" (4,8mm)	2000' (610 M)
	1" (25,4mm)	3/16" (4,8mm)	2000' (610 M)
RH-125	3/4" (19mm)	1/8" (3,2mm)	2000' (610 M)
	1" (25,4mm)	1/8" (3,2mm)	1500' (460 M)
KW-187	5/8" (15,8mm)	3/16" (4,8mm)	1800' (550 M)
	7/8" (22mm)	3/16" (4,8mm)	1200' (370 M)
Knitted Tadpole Tape	1 1/8" (28,5mm)	1/8" tail (3,2mm) 1/4" bulb (6,35mm)	650' (200 M)
	1 3/8" (35mm)		650' (200 M)
Woven Tadpole Tape	1 3/8" (35mm)	1/16" tail (1,6mm) 1/4" bulb (6,35mm)	530' (160 M)

FIL-TEC™

FIL-TEC, Inc.
P.O. Box B
Hagerstown, MD 21741-1191
Phone: (301) 824-6166
FAX: (301) 824-6938

Fiberglass Rope

Specifications*

DIAMETER	LOW DENSITY ROPE											
		TYPE #1		TYPE #2								
	STYLE NUMBER	YIELD FT./LB. (meters/kg.)	FT./CS. (meters/cc.)	YIELD FT./LB. (meters/kg.)	FT./CS. (meters/cc.)	STYLE NUMBER	YIELD FT./LB. (meters/kg.)	FT./CS. (meters/cc.)	STYLE NUMBER	YIELD FT./LB. (meters/kg.)	FT./CS. (meters/cc.)
3/16" (4.8mm)	LD-187	210' (140 M)	5600' (1875 M)	-	-	-	-	-	TNB-187	100' (73 M)	5000' (1830 M)
1/4" (6.4mm)	LD-250	85' (57 M)	3000' (915 M)	73' (49 M)	2250' (690 M)	MX-250 MD-250	80' (49 M) 53' (36 M)	2500' (760 M) 1900' (580 M)	HD-250	77' (52 M)	3300' (1005 M)
5/16" (7.9mm)	LD-312	-	-	55' (39.6 M)	2500' (760 M)	-	-	-	HD-300	58' (32.3 M)	2200' (670 M)
11/32" (8.7mm)	LD-360	-	-	32.5' (21.8 M)	1600' (490 M)	-	-	-	-	-	-
3/8" (9.5mm)	LD-375	45' (31 M)	2000' (610 M)	35' (23.5 M)	1600' (490 M)	MX-375 MD-375	30' (20 M) 44.5' (30 M)	1400' (430 M) 1900' (490 M)	HD-375	23' (15.4 M)	1000' (305 M)
1/2" (12.7mm)	LD-500	30' (20 M)	1350' (410 M)	23' (15.4 M)	1000' (305 M)	MX-500 MD-500	17' (11.4 M) 23' (14.4 M)	600' (245 M) 1100' (395 M)	HD-500	13' (8.7 M)	650' (200 M)
5/8" (15.9mm)	LD-625	20' (13.4 M)	900' (275 M)	17' (11.4 M)	800' (245 M)	MD-625	11' (7.4 M)	560' (170 M)	XL-625 HD-625	11.8' (7.9 M) 8.3' (5.5 M)	500' (150 M) 400' (120 M)
3/4" (19mm)	LD-750	16.5' (11 M)	800' (245 M)	12' (8 M)	600' (180 M)	MD-750	8.7' (5.8 M)	400' (120 M)	HD-750	6.5' (4.4 M)	300' (90 M)
7/8" (22mm)	LD-875	7' (4.7 M)	350' (100 M)	-	-	-	-	-	-	-	-
1" (25.4mm)	LD-1	10.5' (7 M)	500 (150 M)	5.7' (3.8 M)	265' (80 M)	-	-	-	HD-1	3.5' (2.3 M)	170' (50 M)
1 1/4" (32mm)	LD-1.2	6.5' (4.2 M)	300 (90 M)	4.4' (2.9 M)	200' (60 M)	-	-	-	HD-1.0	2.7' (1.8 M)	100' (30 M)
1 1/2" (38mm)	LD-1.5	-	-	1.87' (1.25 M)	90' (25 M)	-	-	-	-	-	-

*Specifications apply to plain white rope gasketing supplied bulk in a case. Applying graphite, adhesive or PTFE may reduce diameter and yield of finished product.

Width/Yield Tolerance: ±5%

Quantities/Case will vary.

Packaging Specifications

Case Size: 15½" X 15½" X 18"
(39,4 X 39,4 X 45,7 cm)
Case Weight: 30-45 lbs. (14-21 kg)
Cases/Skid: 18
Skid Size: 51" X 38" X 60"
(130 X 97 X 152 cm)

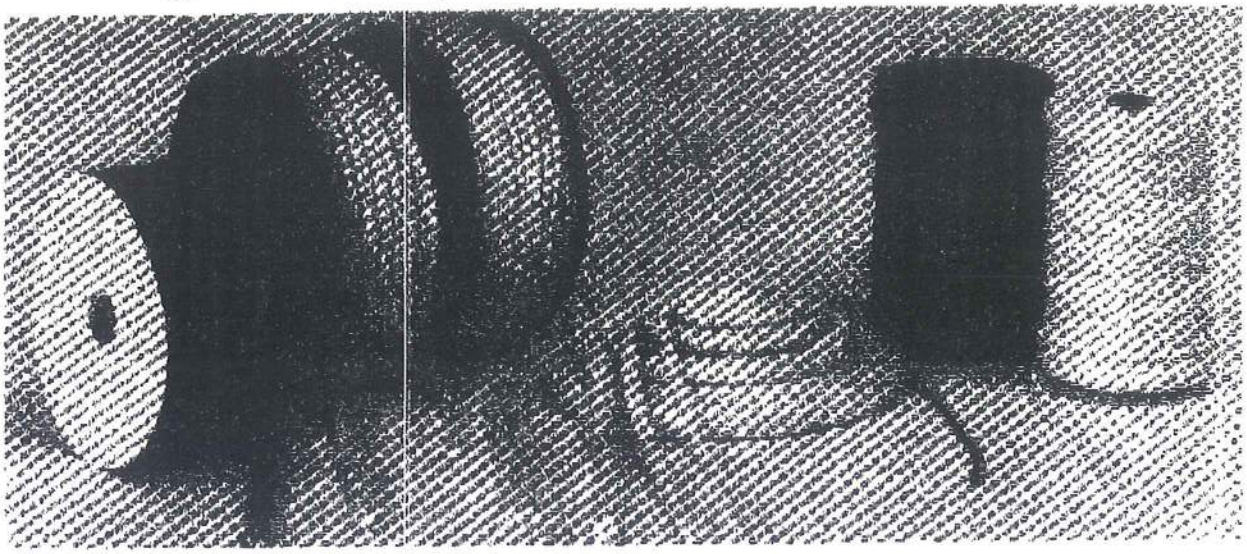
FIL-TEC™
FIL-TEC, Inc.
P.O. Box B
Hagerstown, MD 21741-1191
Phone: (301) 824-6166
FAX: (301) 824-6938

PRODUCT DATA

HIGH TEMPERATURE GASKETING

FIL-TEC™

Fiberglass Rope (Low, Medium and High Density)



Properties (Plain White)

Service rating to 1000° F (538° C). No environmental hazards (non-asbestos). Flexible for easy installation around corners and bondable to most materials. Excellent thermal endurance and chemical resistance (pH range 4-9). Resists most acids and dilute alkalies.* Will not absorb water or attract mold/mildew. Durable for long life under abrasive conditions. Minimal unravel/fraying when cut.

Features (Optional)	Advantages
Available with Graphite coating	More abrasion resistant than natural white; Black color blends with unit...giving a higher quality appearance. Ends gasket painting/sticking problems.
Available with pressure sensitive adhesive applied to one side of rope.	Faster installation and increased productivity. Eliminates messy glues and cements.
Available with wire jacket	Longer lasting and increased strength
Available with wire mesh core	Resilient under pressure... springs back upon load release
Impregnated with PTFE (see separate product data sheet).	Low coefficient of friction. Excellent chemical resistance.
Available in four density levels	Choose the density that meets your needs

Applications:

- Boilers
- Sectional Boilers (Between Sections)
- Gas Fireplaces
- Wood Stoves
- Gas Stoves
- Coal Stoves
- Tile Stoves
- Pellet Stoves
- Furnaces
- Ovens
- Dust Collectors
- Pollution Control Equipment
- Low Pressure Castings
- Kiln Car Seals
- Tadpole Tape Core Material
- Fireproof Safes

*Exceptions: Hydrofluoric and Hot Phosphoric Acid.

See back for sizes available and specifications

P.O. Box B • Hagerstown, Maryland 21741-1191 • Phone (301) 824-6166 • Fax: (301) 824-6938

Lydall

0.125" Manniglas® 1200, 1900, 2000

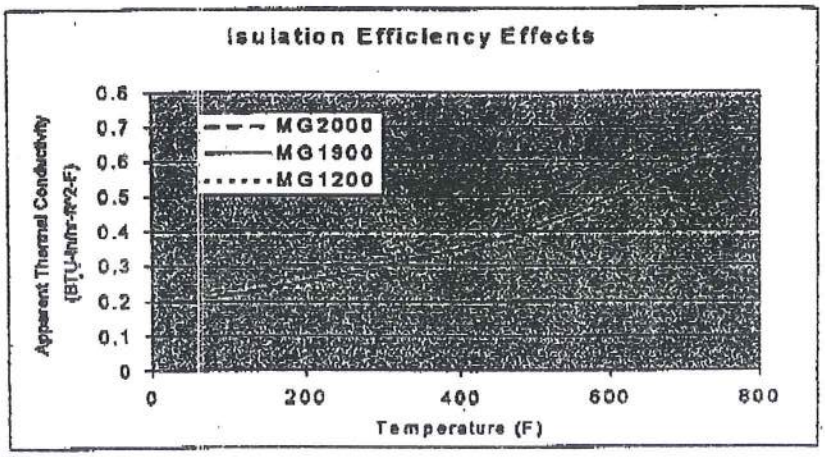
NONWOVEN GLASS-FIBER FOR CRITICAL THERMAL BARRIER APPLICATIONS

PRODUCT COMPARISON SHEET

Note: Product data sheet presents nominal property data only and should not be interpreted as a specification.

Property	MG1200	MG1900	MG2000*	Test Method Based On
Thickness (inch) @ 0.5 psi	125	125	125	
Basis Weight (lb/2880 ft^2)	260	213	~208	TAPPI T-410
Apparent Density (lb/ft^3) @ 0.5 psi	8.7	7.5	~7.0	
Tensile Strength (lbf/in)				TAPPI T-494
Machine Direction	45	41	~30	
Cross Direction	50	29	~30	
Ash	94%	94%	94%	TAPPI T-1013
Thermal Conductivity (BTU•in/hr•ft^2•°F)				ASTM C518-91
75°F	0.21	.21	.22	
250°F	0.28	.27	.31	
500°F	0.41	.40	.48	
750°F	0.57	.64	.76	

*MG2000 is under development. Data were collected on limited sampling.



Prepared 1/20/03

Lydall P.O Box 328, Troy, New York 12181
68 George Street Green Island, New York 12183
Phone: (518) 273-6320 Fax: (518) 273-6361 On-line: www.lydall.com

PRODUCT

MARYLAND

Medium Duty Fireclay Brick

REFRACTORIES TECHNICAL DATA

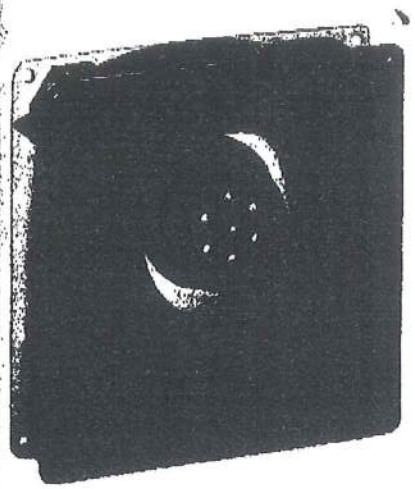
CLASSIFICATION		Alumina-Silica Fireclay Brick ASTM C-27 Medium Duty
P.C.E.		Cone 29 - 30
METHOD OF MANUFACTURE		Dry Press
CHEMICAL ANALYSIS (approximate)		
Silica	[SiO_2]	59.5%
Alumina	[Al_2O_3]	34.1%
Ferric Oxide	[Fe_2O_3]	2.1%
Titania	[TiO_2]	1.8%
Alkalies	[Na_2O+K_2O]	1.9%
MODULUS OF RUPTURE		700 - 1000 psi
APPARENT POROSITY		14% - 16%
BULK DENSITY		129 lbs./cu.ft.

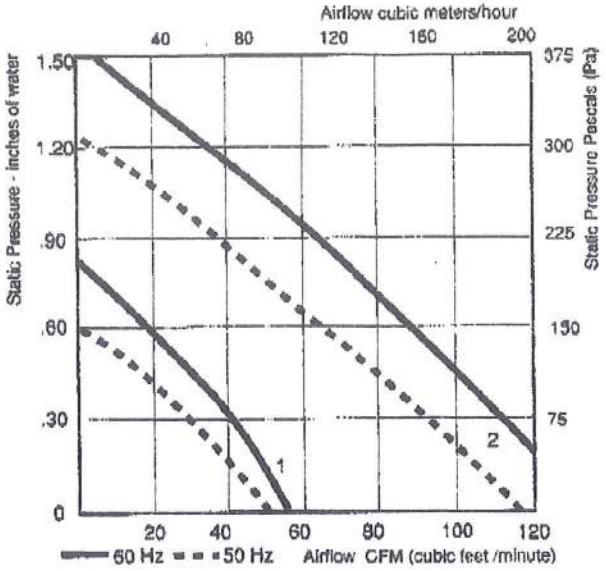
NOTE: All data subject to reasonable deviation and should not be used for specification purposes.

3001

AC FLATPAK™

RG125 & RG160



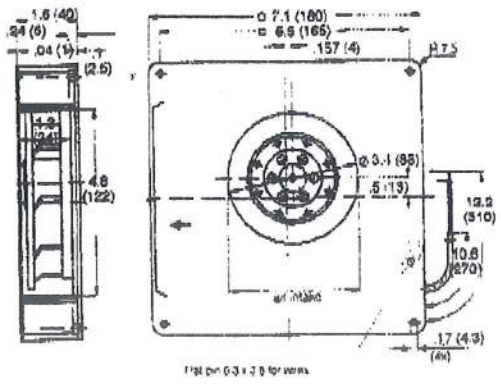


- Shallow, compact radial blowers; air enters through center of impeller and exhausts through port on side of housing
- Mount in any position. Can be used for either pressurizing or evacuating
- Also excellent for spot cooling.

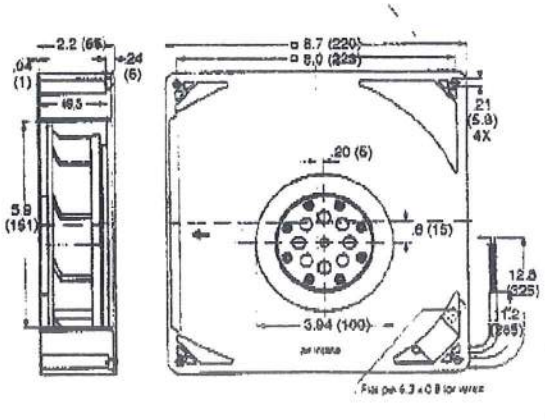
AC FLATPAK Specifications

Curve Number	PART NUMBER	Type of Bearing	AC Volts	Hertz	Watts	CFM @ 0"	dBA	Temp. Max. °C	Wgt. (oz.)	Wiring	Approvals UL	CSA	VDE
1	**RG125-19/06**	Ball	115	50/60	19	55	60	80	30	Leads[1]	√	√	√
1	**RG125-19/56**	Ball	230	50/60	19	55	60	80 (176 F)	30	Leads[1]	√	√	√
2	**RG160-28/06S**	Ball	115	50/60	50	131	69	80	60	Leads[2]	√	√	√
2	**RG160-28/56S**	Ball	230	50/60	50	131	69	80	60	Leads[2]	√	√	√

[1] 22 AWG 12.2" (310MM) leads
[2] 18 AWG 12.8" (325MM) leads



RG125



RG160

JØTUL

June 3, 2006

Mr. Chip Wadington
Lokee Testing Laboratory
13235 Prairie Circle East
Sumner, Washington 98390

Dear Mr. Wadington,

The following is a guideline for adjusting the air control of the Jøtul C350 in order to achieve burn rates in the appropriate categories. The blower speed for each test category is also indicated.

The primary air is operated by a slide type control located at the upper right front corner of the stove.

The secondary air is controlled through an opening located at the center rear bottom of the stove. Secondary air is a non-adjustable fixed opening size.

Air Control and Blower Setting

Burn Rate	Primary Air	Blower Speed / Time on
Low (Min. dry kg/hr)	1/8" Open	Low / On at 30 minutes
Med. Low (< 1.25 dry kg/hr)	3/16" open	Low / On at 30 minutes
Med. High (1.25-1.90 dry kg/hr)	1/4" open	Low / On at 30 minutes
High (Max dry kg/hr)	Max. open	High / Entire test

Air and blower setting information contained in the operation manual will be presented in a way as to be representative of the information contained above.

Sincerely,

Roger W. Purinton
Project Engineer
Jotul North America
55 Hutcherson Drive
Gorham, Maine 04038

Tel. (207) 797-5912
Fax (207) 772-0523

Jøtul North America
P.O. Box 1157, Portland, Maine 04104 www.jotulflame.com

Operation

Read the following section carefully before building a fire in your Jøtul C350 Fireplace Insert.

Fuel

This stove is designed to burn natural wood ONLY. Wood that has been air-dried for a period of 6 to 14 months will provide the cleanest most efficient heat. **Frequent use of green or inadequately seasoned wood is conducive to creosote accumulation and generally poor performance.**

DO NOT BURN...

- Coal
- Garbage
- Cardboard
- Solvents
- Treated or painted wood
- Chemical Chimney cleaners
- Colored paper
- Any synthetic fuel or logs

The burning of any of these materials can result in the release of toxic fumes. **NEVER USE GASOLINE, GASOLINE-TYPE LANTERN FUEL, KEROSENE, CHARCOAL LIGHTER FLUID, OR SIMILAR LIQUIDS TO START OR "FRESHEN-UP" THE FIRE. Always keep such liquids away from the heater at all times.**

WARNING

NEVER ALLOW THE FIRE TO REST DIRECTLY ON THE GLASS. THE LOGS SHOULD ALWAYS BE SPACED AT LEAST ONE INCH FROM THE GLASS TO ALLOW FOR PROPER AIR FLOW WITHIN THE STOVE.

Air Control Settings

A single lever regulates the Primary Air flow that controls the intensity of the fire and consequent heat output and burn time. This lever is located within the slot on the upper right front of the firplace insert.

When first starting or reviving the fire, the control lever should be set at the far right position to allow the maximum amount of air into the stove. See fig. 19. After the fire is well-established, the lever should be set at position to moderate incoming air to maintain the desired long term heat output and/or burn time.

In general, the more air made available to the fuel will result in the hottest fire intensity and the fastest fuel consumption. Alternatively, the less air made available to the firebox will result in low heat output and slow fuel consumption.

WARNING:

OPERATE THIS FIREPLACE INSERT ONLY WITH THE FRONT DOORS FULLY CLOSED. PARTIALLY OPENED DOORS MAY RESULT IN OVERFIRING. ALSO, IF DOORS ARE LEFT PARTLY OPEN, GAS AND FLAME MAY BE DRAWN OUT OF THE STOVE OPENING, CREATING RISKS FROM BOTH FIRE AND SMOKE.

Blower Settings / Air Control

Use the following guide to establish optimal performance from the C 350.

Burn Rate	Air Control Setting	Blower Speed
Low	1/8" Open	Low / On at 30 min.
Med. Low	3/16" Open	Low / On at 30 min.
Med. High	1/4" Open	Low / On at 30 min.
High	Max. Open	High / On

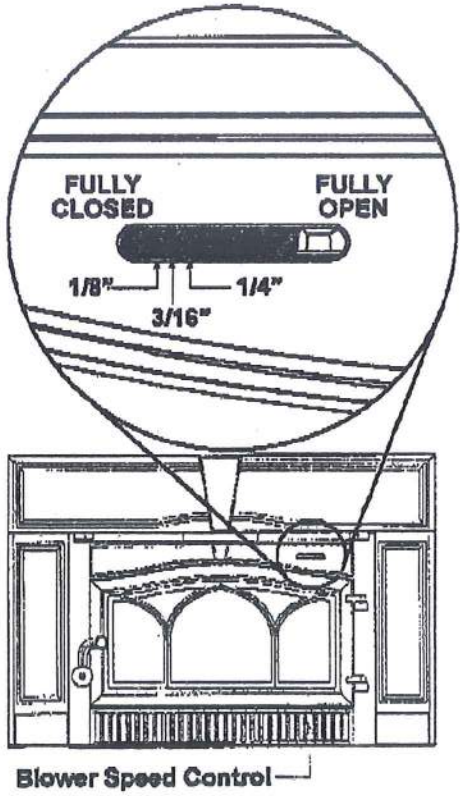


Figure 19. Air Control Setting

APPENDIX
A

EXAMPLE CALIBRATION/DATA FLOW

All individual test run raw data sheets are organized in a manner that would allow a data reviewer to follow the data as it is being calculated in a step by step fashion. In many cases, the equations used to calculate a specific required data are given on the raw data sheets themselves.

For example, the particulate emission rate in g/dscf is calculated on Data Sheet #7. However, the data used to derive this data begins on Data Sheet #2 (Meterbox Data Sheet) where the meter volume (cubic feet), average meter temperature (°F), average ΔH (in. H_2O), and average Barometric pressure (in. Hg) are recorded and averaged. Each of the averages for these parameters are used in equation 1 on P. 7 where the volume (MCF) is converted to dscf.

The moisture catch total (g. H_2O) on the Particulate Catch/Moisture Data sheet (p. 3) is transferred to P. 7 and the percent stack moisture is calculated in equations 2 and 3.

The gross and net gravimetric (g) particulate catches are determined and calculated on PP. 3-6. Pages 4-1, 4-2 and 4-3 show the initial (tare) constant weights for filters (p. 4-1) and beakers (p. 4-2) and the final constant weights (p. 4-3) for those filters and beakers used for each run. Final and tare weight data is transferred to P. 3 and the gross gravimetric (g) catch for each filter and beaker is calculated. On P. 5 the gravimetric catch for each blank is calculated. The gross gravimetric catch for each filter and beaker is transferred to P. 6 and the net gravimetric catch (g) is calculated, as well as front half and back half catch totals. The net gravimetric catch (g) is transferred to P. 7 and the grain loading/dscf is calculated in equation 4.

Some data sheet specific information is listed below on a page by page basis.

P. 8 The % ambient moisture is determined by interpolating from psychrometric charts which are contained in the State of Oregon Department of Environmental Quality's "Standard Method for Measuring the Emissions and Efficiencies of Woodstoves".

The % relative humidity is determined from the wet bulb/dry bulb temperature readings using the tables found in Section 3.1.2.4 of the State of Montana Air Quality Bureau's Quality Assurance Manual.

P. 10 The uncorrected moisture meter readings are corrected for pin insulation and may or may not be corrected for ambient (wood) temperatures. All corrections are based upon the correction equations or tables supplied by the moisture meter manufacturer. (These are standard, known corrections.)

P. 11 The moisture meter readings are corrected as discussed above.

P. 12 The gas concentrations shown for each gas monitored (CO_2, O_2, CO and SO_2) are determined by converting the analyzer's voltage output recorded on P. 12 to the concentration shown using the analyzer's current calibration curve. The SO_2 concentration is determined using the manufacturer's calibration curve and the current calibration curve.

The cal. W/B (calculated wet bulb) temperature is obtained by first determining the % moisture in the extracted flue gas stream using the temperature data from thermocouples 1 (Wet Bulb) and 2 (Dry Bulb). Then based upon the stack temperature (thermocouple 3) and the % moisture in the extracted gas stream, a calculated wet bulb temperature is determined. All data is derived from the psychrometric tables found in the State of Oregon's "Standard Method for Measuring the Emissions and Efficiencies of Woodstoves".

The following pages contain the equations used to generate the data on Tables 3-5 on the computer printouts:

Dry Gas Volume (standard):

$$V_{m(std)} = \frac{V_m * 17.65 * mcf * \left(P_{bar} + \frac{\Delta H}{13.6} \right)}{T_m}$$

Volume of Water:

$$V_{w(std)} = (0.04707)(ml\ H_2O)$$

Moisture Content:

$$B_{ws} = \left(\frac{V_w}{V_w + V_{m(std)}} \right) * 100$$

Dry Burn Rate:

$$Br = \left(\frac{Wwt - (Wwt * \%\ H_2O)}{2.2046} \right) * \frac{60}{\theta}$$

Carbon Balance (N_t):

$$Nt = \frac{K_3 Nc}{(YCO_2 + YCO + YHC)}$$

Stack Flow Rate (Q_{sd}):

$$Q_{sd} = K_4 N_t Br$$

Particulate Concentration (C_s):

$$C_s = \frac{M_n}{V_{m(std)}}$$

Particulate Emission Rate (E):

$$E = C_s Q_{sd}$$

Proportional Rate Variation (Pr):

$$Pr = \left(\frac{\theta S_i * V_{mi(std)}}{10 \sum_{i=1}^{n} [S_i * V_{mi(std)}]} \right) * 100$$

Where:

Br =	dry wood burn rate, kg/hr.
B_{ws} =	Water vapor in the gas stream, proportion by volume.
c_s =	Concentration of particulate matter in stack gas, dry basis, corrected to standard conditions, g/dscm (g/dscf).
E =	Particulate Emission Rate, g/hr.
ΔH =	Average pressure differential across the orifice meter (see Figure 5-2), mm H_20 (in. H_20).
K_3 =	1.0 lb/lb (English) 1000 g/kg (metric)
K_4 =	0.02406 dsm^3/g-mole(metric) 384.8 dscf/lb-mole (English)

m_n = Total amount of particulate matter collected, mg.

mcf = Dry gas meter correction factor.

N_c = Gram atoms of carbon/gram of dry fuel (lb/lb), equal to 0.0425.

N_t = Total dry moles of exhaust gas/Kg of dry wood burned.

P_r = Percent of proportional sampling rate.

P_{bar} = Barometric pressure at the sampling site, mm Hg (in. Hg).

Q_{sd} = Total gas flow rate, dscf/hr.

S_i = Concentration measured at the SO_2 analyzer for the "i^{th}" 5 minute interval, ppm.

S_1 = Concentration measured at the SO_2 analyzer for the first 5 minute interval, ppm

T_m = Absolute average DGM temperature (see Figure 5-2), °K (°R).

T_{std} = Standard absolute temperature, 293°K (528°R).

V_m = Volume of gas sample as measured by dry gas meter, dcm (dcf).

$V_{m(std)}$ = Volume of gas sample measured by the dry gas meter, corrected to standard conditions, dscm (dscf).

$V_{w(std)}$ = Volume of water vapor in the gas sample, corrected to standard conditions, scm (scf).

W_{wt} = Wet wood weight.

Y = Dry gas meter calibration factor.

Y_{CO} = Measured mole fraction of CO (dry).

Y_{CO2} = Measured mole fraction of CO_2 (dry).

Y_{HC} = Assumed mole fraction of HC (dry);
=0.0088 for catalytic woodheaters
=0.0132 for noncatalytic woodheaters
=0.0080 for pellet fired woodheaters

θ = Total sampling time, min.

13.6 = Specific gravity of mercury.

60 = Sec/min.

100 = Conversion to percent.

M5H PARTICULATE SAMPLING TRAIN

1. Probe

   3/8" seamless SS-20" long. Outlet end of probe is attached to a SS outlet fitting with a Sweglock SS union. The probe is unheated except for the portion that is in the stack and the heated filter box. The probe is sealed to the stack with a washer.

2. Filter Holder

   A 3" or 4" standard M5 filter holder. A SS filter support with gasket.

3. Filters

   3" or 4" fiber glass (#25 glass) manufactured by Schleicher and Schuell.

4. Front Half Filter Heater

   A box containing a fan for air circulation and a cone heater. The temperature in the box is monitored with a type K thermocouple and adjusted with a voltage regulator to maintain a temperature below 248 °F.

5. Desiccant

   Indicating silica gel, 6-20 mesh. The silica gel is changed as needed.

6. Filter (Back Half) Holder

   Same as front half 3" or 4" filter.

7. Impinger Gas

   Type K thermocouple threaded into the exit "arm" of the impinger. Ice is added to the cooler whenever necessary to maintain an exit gas temperature less than 68 °F.

8. Meterbox

   RAC Stack Sampler modified by EEMC

   Ranges: 0-1.0" inclined water manometer

   0-10.0" vertical water manometer

   Accuracy: Dry gas Meter 0-999.999 cu ft ±1.0%

   Temperatures are monitored using two type K thermocouples.

APPENDIX B

SAMPLING PROCEDURES AND INSTALLATION DESCRIPTION

This section is broken into two major parts. The first contains a brief description of the sampling and procedures used by LoKee Testing Laboratory when performing a test using EPA Methods 28, 28A and 5H. The second section contains a complete listing of all equipment in each of the major sampling trains and a diagram of each major train.

LoKee Testing Laboratory uses EPA M5H for the particulate sampling procedure and collects the required data so that efficiency of a unit can be calculated using the Oregon Method.

TEST FACILITY AND WOOD HEATER EQUIPMENT LIST

1. Flue Pipe

   The diameter of the 24 gauge black steel flue pipe used for each stove varies with the size of the stove's flue collar, e.g., 6" flue pipe is used with a 6" flue collar. The joint at the flue collar is sealed with mortar. The pipe is attached to the stove at the flue collar with three sheet metal screws. All sampling ports are sized for the sampling probes and sealed using washers.

2. Insulated Flue Pipe

   The diameter of the insulated flue pipe matches the diameter of the flue collar on the stove. The 6", 7" and 8" pipe meet the requirements of UL 103 HT. The SO_2 injection loop port is sealed with high temperature silicone sealant.

3. Liquid Seal

   The liquid (oil) seal used by LoKee varies in size with the flue pipe. The seals are made of 12 gauge steel. The liquid sealant is mineral oil. The cooler consists of 3/8" copper tubing which is coiled in the bottom of the lower half of the seal. Ambient air is pumped through this line when necessary to cool the seal.

4. Supports

   The lower half of the seal and the 24 gauge steel black flue pipe is supported by the stove. The upper half of the seal and the insulated flue pipe are hung from wooden supports.

5. Platform Scale

   Platform (30" X 30" deck)

   Manufacturer: Weightronics

   Model: platform: DS-014/SN 4479 readout: W1-110/SN 016409

   Type: Electronic

   Range: 0-1000 lb.

Capacity:	1000 lb.
Resolution:	±0.1 lb.
Accuracy:	±0.1%

6. Fuel Balance Scale

LoKee uses the platform scale listed above to weigh the fuel charges.

7. Fuel Storage Area

LoKee stores the fuel in a humidity and temperature regulated room.

8. Moisture Meter

LoKee has two moisture meters which it uses to determine wood moisture levels.

The primary meter is:

Manufacturer:	Delmhorst Instrument Co.	
Model:	RC-1C/SN 16152 with 26-E probe and #496 insulated pins.	
Type:	Electrical Resistance	
Resolution:	±0.1% moisture	
Ranges:	6-11%, 11-25%, 25-80%	
Accuracy:	Moisture	Content Accuracy
	6-12%	±0.5%
	12-20%	±1.0%
	20%-saturation point	±2.0%

Type of Calibration: The RC-1C is equipped with two potentiometers (Zero and Span) which are checked and adjusted on a daily basis. The unit is also checked with a calibration block.

Electrode and Pin Type: 26-E probe and #496 insulated pins

The backup moisture meter:

Manufacturer:	Delmhorst Instrument Co.	
Model:	G-30SN/2477 with 26-E probe and #496 insulated pins	
Type:	Electrical Resistance	
Resolution:	±0.1% moisture	
Accuracy:	Moisture	Content Accuracy
	6-12%	±0.5%
	12-20%	±1.0%
	20%-saturation point	±2.0%

Type of Calibration: Calibration is accomplished with an internal calibration point and a potentiometer. The calibration can also be checked against a calibration block.

Description of Operation: The pins are pounded into the wood to be sampled. The meter reading is recorded on Data Sheet #10 (Wood Moisture) or Data Sheet #11 (Density Determination). This is the uncorrected reading which is then corrected for pin insulation and, as needed, temperature using the correction tables for each parameter supplied by the manufacturer.

9. Temperature Monitors

The temperatures are monitored with Type K thermocouples. Each thermocouple's calibration is checked prior to use.

The thermocouple readout is an Omega Model 410B-K/SN 05/4475, with a range of -58 °F to 1999 °F (type K) and an accuracy of ±0.9 °C, which can be read at ±0.1 °F. EEMC reads and rounds to 1.0 °F. The single channel readout is interfaced with a manually operated selector switch that allows 24 channels to be monitored with the same readout. The thermocouples are attached to the test unit with sheet metal screws. The thermocouples monitoring internal stove temperature are sealed at the point of entry with sealant.

10. Draft Gauge

Manufacturer:	Dwyer
Model:	
Type:	Inclined Water Manometer
Range:	0-0.25" water
Resolution:	0.001" water
Accuracy:	±0.001" water (readability)

11. Anemometer

Manufacturer:	Dwyer
Model:	480 Vaneometer/SN S 222 D
Range:	0-400 FPM
Accuracy:	±5% of full scale from 0-1 FPM

12. Humidity Gauge

Manufacturer:	Bacharach
Model:	SAC
Type:	Sling Psychrometer
Range:	Wet Bulb: 30-110 °F
Dry Bulb:	30-110 °F
Resolution:	±1 °F
Accuracy:	±1 °F

13. Barometer

Manufacturer:	Princo Instruments, Inc.
Model:	NOVA 469

Type:	Mercury Barometer
Range:	20-32" Hg
Resolution:	0.01" Hg
Accuracy:	±0.01" when calibrated and installed as per the manufacturer's written operating instructions.

Equation 6.3.1a of the "Standard Methods for Measuring the Emissions and Efficiencies of Residential Wood Stoves" and equation #1 are programmed into a Hewlett Packard 15C calculator which first calculates stack gas flow rate and then the ΔH. The stack gas flow rate and ΔH are both recorded on Data sheet #2. The ΔH is used to set the flow rate through the dry gas meter at 5 minute intervals during the test.

In order to successfully maintain the correct sampling ratio, the following data is recorded on Data Sheet #2 (Meter Box Data Sheet): temperature (°F) at the SO_2 injection rotameter (Tr), pressure (inches H_2O) at the SO_2 injection rotameter (Pr), SO_2 injection rate (cc/min), barometric pressure (BP) (inches Hg), stack gas SO_2 concentration (ppm SO_2), sampling ratio (Sr), and the average dry gas meter temperature (°F). This data is entered into the HP15C, which is used to first calculate a stack gas flow rate (dscf) and then a ΔH for every sampling interval. The flow rate through the dry gas meter is adjusted and maintained by maintaining the appropriate ΔH.

CEM MONITORS

1. Calibration Gases

   LoKee uses vendor certified (±2.0%) calibration gases for each CEM. The concentrations purchased coincide with ranges specified in M5H. Upon receipt of the cylinder, the concentrations are verified with Method 3 (ORSAT) analysis.

2. Flow Regulators

   LoKee uses a variety of standard gas flow regulators to meter the flow of calibration gases from the cylinders.

3. Point of Injection

   Calibration gases are injected directly into the end of the probe. The line carrying the calibration gases from the cylinders is connected to the probe with a short piece of rubber tubing.

4. Sample Gas Conditioning System

   The combustion gas is conditioned with a train that is a duplicate of a M5H train. It contains the following components:

   SS probe

   Glass 4" M5H filter and holder in a heated box

4 1000 ml glass impingers

Glass 4" M5H filter and holder

Indicating silica gel

Type K thermocouple to monitor exit gas temperature

Thomas pump

5. Filters

The filters used are the same as EPA M5H filters.

6. Manifold and Exhaust

The gas stream is delivered to each analyzer through a manifold and flowmeter with the excess gases being routed to an exhaust.

7. CO Analyzer

Horiba PIR 2000/SN 408005

Nondispersive infrared (NDIR)

The gas stream flow is controlled by a SS flowmeter downstream of the analyzer. The calibrated range used is 0-10.0% by volume. The resolution is 0.01% CO. The manufacturer's specification given for linearity is ±1.0%.

8. CO_2 Analyzer

Horiba PIR 2000/SN 407069

The CO_2 analyzer is also a NDIR and is operated in exactly the same manner as the CO analyzer. The range of the CO_2 analyzer is 0-25.0% CO_2.

COMBUSTION GAS ANALYZER TRAIN OPERATING INSTRUCTIONS

A. Pretest Preparation, Checks and Audit Procedures

1. Clean the probe with acetone and a brush. Seal the end of the probe for a leak check.
2. Remove the filter holder from the sample box and change the filter.
3. Empty water from all the impingers in the train. Clean all impingers and fill the first 2 with 100 ml of water.
4. Remove the second filter holder from the train and change the filter.
5. Visually check the indicating silica gel in the fourth impinger. If it is visibly impacted by water, replace the silica gel with dry silica gel.
6. Turn on the pump and perform a leak check on the entire train. This is done by placing the exhaust line in water. A successful leak check is accomplished when no bubbles are detected.
7. Slowly release the plug from the probe to prevent any back flushing.
8. Turn off the pump.

9. Turn on the heat in the sample box. Adjust Variac voltage controller so that temperature in the sample box does not exceed 248 °F.
10. Open the bypass valve on the pump.
11. Connect the probe to the zero/span gas delivery line.
12. Turn on the zero gas and adjust the flow rate to 1.5 SCFH.
13. Wait until the zero gas has completely flushed the train and a stable reading is obtained.
14. Record the zero gas readings of the DVM on Data Sheets #15.
15. Turn off the zero gas at the cylinder.
16. Disconnect the zero/span gas delivery line from the zero gas cylinder.
17. Connect the zero/span gas delivery line to the span gas source for each analyzer.
18. Turn on the span gas and adjust the flow rate to 1.5 SCFH. Wait until a stable reading is obtained on each analyzer. Repeat until all three analyzers are spanned properly.
19. Record the span gas readings of the DVM. Record the analyzer's output and all other pertinent information Data Sheets #15.
20. Turn off the span gas at the cylinder.
21. Disconnect the probe from the zero/span gas delivery line.
22. Insert the probe in the stack.
23. Close the bypass valve on the pumps.
24. Approximately 15-20 minutes before the actual start of the test, turn on the pump and adjust the flow through each analyzer until the flow rate is 1.5 SCFH.

B. Operation During Testing

1. Monitor the flow rate to the analyzers periodically to maintain a flow rate of 1.5 SCFH. Make any necessary adjustments.
2. Record data as follows:
   a. At the start of each 5 minute data cycle, record the scale weight, wet bulb/dry bulb, stack gas temperature and static pressure on Data Sheet #12 (Gas Data).
   b. Record the combustion gas (CO_2, O_2 and CO) analyzer data and the SO_2 analyzer data on Data Sheet #12.
   c. Record the remainder of the temperature data.

C. Post Test Checks and Audit Procedures

1. Remove the probe from the stack. (Be careful when handling the probe as it can be quite hot.)
2. Seal the end of the probe.
3. Perform a leak check on the entire train.
4. Slowly release the plug from the end of the probe to prevent any back flushing.
5. Turn off the pump.

6. Open the bypass valve on the pump.
7. Connect the probe to the zero/span gas delivery line.
8. Turn on the zero gas and adjust the flow rate through each analyzer to 1.5 SCFH.
9. Wait until the zero gas has completely flushed the train and a stable reading is obtained from each analyzer.
10. Record the zero gas reading. Record each analyzer's output and all other pertinent information on Data Sheets #15.
11. Turn off the zero gas at the cylinder.
12. Disconnect the zero/span gas delivery line from the zero gas cylinder.
13. Connect the zero/span gas delivery line to the span gas source for each analyzer.
14. Turn on the span gas and adjust until the flow rate through each analyzer to 1.5 SCFH. Wait until the span gas has completely flushed the train and a stable reading is obtained on each analyzer.
15. Record the span gas reading. Record each analyzer's output and all other pertinent information on Data Sheets #15.
16. Turn off the span gas at the cylinder.
17. Disconnect the probe from the zero/span gas delivery line.

D. Determination of the Combustion Gas Train's Response Time

1. The response time of the combustion gas analyzer train is to be determined using the following procedures. It is best to determine the combustion gas analyzer train response time during the "charcoal phase" of a test burn so that CO levels are relatively stable.
   a. Leak check the combustion gas (CEM) analyzer train.
   b. Zero the CO analyzer using ambient air.
   c. Calibrate the CO analyzer.
   d. Insert the probe for the combustion gas analyzer train in the stack.
   e. Sample flue gas until a stable reading is obtained.
   f. Remove the probe from the stack, note the exact CO concentration as measured on the DVM and start a stop watch at the exact time of removal.
   g. Observe the stop watch and DVM. Record the length of time to initial response, i.e., when the CO levels begin to decline.
   h. Continue observing the stop watch and DVM. Record the time when the analyzer's output equals zero (0.000 v).
   i. Repeat steps d-h 2 or 3 times to verify results.

E. Calibration and Audit Procedures for the Combustion Gas Analyzers

1. Calibrate by presenting zero and span gases to each analyzer at the probe and through the entire sampling train. (See Sections 6.7.2 and 6.9 [M5H].) Record the responses on the appropriate calibration forms.
2. Immediately prior to and after each test run, present the zero and span gases to the analyzers through the entire sampling train as is discussed in section C. Record each analyzer's response on Data Sheets #15.
3. Calculate the ± concentration difference and the actual percent difference as follows using the zero and span gas values obtained in #2 above. All calculations are to be based upon the actual gas concentrations involved.

$$\pm \text{ Concentration Difference} = \text{Actual Conc (\%)} - \text{Std Conc (\%)}$$

$$\text{Zero \% Difference} = \frac{\text{Act Conc (\% or ppm)} - \text{Std Conc (\% or ppm)}}{\text{Full Scale Value (\% or ppm)}} * 100$$

$$\text{Span Act \% Difference} = \frac{\text{Act Response (\% or ppm)} - \text{Exp Response (\% or ppm)}}{\text{Full Scale Value (\% or ppm)}} * 100$$

Then refer to Section 4.2 and 4.3 (M5H) to determine whether the audits are acceptable or not.

TRACER GAS (SO_2) EQUIPMENT

1. SO_2 Injection Probe

   A circular SS loop about 4" in diameter is positioned in the center of the stack. The loop extends outside the stack and is connected to the line leading from the SO_2 injection rotameter with Sweglock fittings. The loop is inserted in the stack at 9.5 ±0.5 ft above the top of the scale.

2. Rotameter

   A rotameter that has been calibrated with a bubble tube. The rotameter is all glass, stainless steel and Teflon. The rotameter has a flow control mechanism which is set to the calibrated flow.

3. Temperature

   The temperature at the injection rotameter is measured with a type K thermocouple.

4. Injection Gas

   Pure SO_2, 99.999% pure, released from the cylinder through a SS regulator and shut off valve.

5. Calibration Gases

LoKee uses vendor certified calibration gases with traceability established in accordance with EPA Protocol #1 as specified in Section 3.3.1 and verified using EPA Method 6.

6. Sample Probe

3/8" SS tubing inserted at 13.5 ±0.5 feet above the platform scale. No obstructions are in the stack between the injection and sample probes.

7. Combustor

Lindberg tube furnace, Model 55035/SN 800125, range 0-2000 °F. The temperature in the tube furnace is monitored with a type K thermocouple and controlled with a Variac voltage regulator. Power adjustments are made as necessary to maintain temperature at 1425 °F ±25 °F.

8. Sample Condenser

The sample condenser consists of 3 modified M5 impingers immersed in a freezer.

A filter assembly

The exit gas temperature is monitored with a type K thermocouple.

9. Filter

A standard EPA M5H 3" or 4" filter.

10. SO_2 Analyzer

Horiba, PIR 2000/SN 403019

Nondispersive infrared (NDIR)

The analyzer is operated as per the manufacturer's instructions at a flow rate of 1.5 SCFH. The calibration range is 0-2500 ppm SO_2 at a resolution of ±25.0 ppm. The manufacturer's specification for linearity is ±1.0%. The voltage response is displayed on a DVM which is converted to ppm using the manufacturer's calibration curves.

11. Flow Control

Flow through the tracer gas sampling train is controlled by a SS flowmeter.

TRACER GAS TRAIN OPERATING INSTRUCTIONS

A. Pretest Preparation and Checks and Audit Procedures

1. Clean the probe with a brush. After cleaning, seal the end of the probe.

   Note: Do Not Use Acetone Or Other Organic Solvents To Clean The Probe Immediately Prior To Running A Test Or Conducting A Leak Check.

2. Turn on the tube furnace in order to insure that the unit is at the correct operating temperature (1425 °F) at the start of the test.
3. Remove all water and clean the impingers.
4. Change the filter.

5. Turn on the pump.
6. Perform a leak check on the entire tracer gas train. This is done by placing the SO_2 exhaust line in water. A successful leak check is accomplished when no bubbles are detected.
7. Slowly remove the plug from the end of the probe to prevent any back flushing.
8. Turn off the pump.
9. Bypass the pump.
10. Connect the probe to the zero/span delivery gas line.
11. Connect the zero/span gas delivery line to the zero gas cylinder and turn on the zero gas and adjust the flow until the flow rate through the SO_2 analyzer is 1.5 SCFH.
12. Wait until the zero gas has completely flushed the train.
13. Record the zero gas reading. Record the SO_2 analyzer's DVM output on Data Sheets #15.
14. Turn off zero gas at the cylinder.
15. Disconnect the zero/span gas delivery line from the zero gas cylinder.
16. Connect the zero/span gas delivery line to the span gas cylinder.
17. Turn on the span gas and adjust the flow until the flow rate through the SO_2 analyzer is 1.5 SCFH. Wait until the span gas has completely flushed the train and a stable reading is obtained on the analyzer.
18. Record the span gas reading. Record the analyzer's output and all other pertinent information on Data Sheets #15.
19. Turn off the span gas at the cylinder.
20. Disconnect the zero/span gas delivery line from the probe.
21. Insert the probe in the stack.
22. Close the bypass on the pump.
23. Approximately 15 to 20 minutes before the actual start of the test, turn on the SO_2 injection train and the pump for the tracer gas train.

B. Operation

1. Turn on the tube furnace to insure furnace is at approximately 1425 °F when the test begins.
2. Approximately 15-20 minutes before the actual start of the test, turn on the cylinder of pure SO_2.
3. Using the rotameter's current calibration, adjust the SO_2 flow rate to the calibrated level.
4. Turn on the pump in the tracer gas train. Adjust the flow rate through the SO_2 analyzer so that it remains at 1.5 SCFH.

5. Monitor the SO_2 concentrations in the stack and stack gas flow rates in order to establish a sampling ratio for the test and a correct ΔH at the start of the test.

6. At the start of the test and every 5 minutes thereafter, record the SO_2 analyzer output in volts and the stack gas SO_2 concentration in order to calculate the stack gas flow rate and determine the correct ΔH for the meter box.

   Also monitor and record the temperature at the Rotameter (Tr), pressure at the Rotameter (Pr), barometric pressure (BP) SO_2 injection rate (cc/min) and static pressure on Data Sheets #2 and #12.

C. Post Test Checks and Audit (Zero/Span) Procedures

1. Remove the probe from the stack. (Be careful when removing the probe from the stack as it can be quite hot.)
2. Plug the end of the probe.
3. Perform a leak check.
4. Slowly remove the plug from the end of the probe to prevent any back flushing.
5. Turn off the pump.
6. Bypass the pump.
7. Connect the probe to the zero/span gas delivery line.
8. Connect the zero/span gas delivery line to the zero gas cylinder. Turn on and adjust until the flow rate through the SO_2 analyzer is 1.5 SCFH.
9. Wait until the zero gas has completely flushed the train.
10. Record the zero gas reading. Record the SO_2 analyzer's DVM output on Data Sheet #15.
11. Turn off zero gas at the cylinder.
12. Disconnect the zero/span gas delivery line from the zero gas cylinder.
13. Connect the zero/span gas delivery line to the span gas cylinder.
14. Turn on the span gas and adjust the flow until the flow rate through the SO_2 analyzer is 1.5 SCFH. Wait until the span gas has completely flushed the train and a stable reading is obtained.
15. Record the span gas reading. Record the analyzer's output and all other pertinent information on Data Sheet #15.
16. Turn off the span gas at the cylinder.
17. Disconnect the zero/span gas delivery line from the probe.

D. Determination of Tracer Gas Train's Response Time

1. Zero and calibrate the SO_2 analyzer.
2. Prepare and leak check the tracer gas train as per A above.
3. Insert the probe in the stack which contains flue gas and SO_2 concentrations in the ranges normally encountered during wood stove testing.

4. Sample flue gas with SO_2 concentrations until a stable reading is obtained. It is best to determine the tracer gas train's response time during the "charcoal phase" of a test burn so that the SO_2 concentrations are as stable as possible.
5. Remove the probe from the stack, noting the exact SO_2 concentration as measured by the DVM and starting a stop watch at the exact time of removal.
6. Observe the stop watch and DVM. Record the length of time to the initial response, i.e., when the SO_2 levels begin to decline.
7. Continue observing the stop watch and DVM. Record the time when the SO_2 analyzer's output equals zero (0.000 v.).
8. Repeat steps 3-7 two or three times to verify results.

E. Calibration and Audit Procedures for the Tracer Gas (SO_2) Analyzer

1. Calibrate by presenting zero and span gases to the analyzer at the probe and through the entire sampling train. Record the responses on the appropriate calibration form.
2. Immediately prior to and after each test run, present the zero and span gases to the analyzer through the entire sampling train as is discussed in Sections A and C. Record the analyzer's response on Data Sheet #15.
3. Calculate the ± concentration differences and actual percent difference as follows using values obtained in #2 above as the expected response. All calculations are to be based upon the actual gas concentration involved.

$$\pm \text{ Concentration Difference} = \text{Actual Conc (\%)} - \text{Std Conc (\%)}$$

$$\text{Zero \% Difference} = \frac{\text{Act Conc (\% or ppm)} - \text{Std Conc (\% or ppm)}}{\text{Full Scale Value (\% or ppm)}} * 100$$

$$\text{Span Act \% Difference} = \frac{\text{Act Response (\% or ppm)} - \text{Exp Response (\% or ppm)}}{\text{Full Scale Value (\% or ppm)}} * 100$$

Then refer to Section 4.2 and 4.3 (M5H) to determine whether the audits are acceptable or not.

TEMPERATURE SENSING OPERATING INSTRUCTIONS

A. Operate the thermocouple readout selector switch and record the temperature for each thermocouple. All the temperature in the test facility should be approximately the same. Repair as necessary.

B. Check the operation and output of the thermocouple readout using the Omega NBS Traceable Thermocouple Simulator. The simulator is hooked up to thermocouple readout #23. Check the readout over its full range at 200 °F intervals. Record the data on Data Sheet #16.

C. One hour before the actual test start record stove temperatures (thermocouple readout #'s 4, 5, 6, 7 and 8), firebox (readout #9), post catalytic combustor or secondary burn chamber (readout #10), and room temperature (readout #11). Record the temperatures every 5 minutes until the start of the test on Data Sheet #13 (Preburn).

D. During the test record the temperatures every 5 minutes for each of the thermocouples on Data Sheets #12 and 14.

FUEL PREPARATION

A. No more than 4 hours prior to use, obtain 3 moisture readings from each piece of wood. Record all moisture readings on Data Sheet #10.

B. Obtain kindling by finely splitting pieces that otherwise cannot be used as test fuel. Weigh the kindling and record the weight on Data Sheet #8.

C. Obtain the pretest fuel by using 2 x 4's. The length of the pretest fuel can be no less than 1/3 the length of the test fuel. Weigh the pretest fuel prior to its being loaded in the stove. Record weights on Data Sheets #8 and #9.

D. Obtain the test fuel by cutting dimensional lumber (either 2 x 4's or 4 x 4's) so that the length is 5/6's the length of the longest usable dimension of the firebox. Use the mix of 2 x 4's and 4 x 4's specified in Section 4.3 M28. The test fuel shall be essentially free of knots, sap seams or rotten areas.

E. The spacers shall measure 1 x 5 x 1" (nominally). The spacers shall be free of knots, sap seams or rotten areas. Nail the spacers to the 2 x 4's and 4 x 4's as described in the regulations.

F. Take a photograph of the assembled fuel charge at a 90° angle from the photograph that will be taken when the fuel charge is loaded in the stove.

WOOD DENSITY DETERMINATION

A. When cutting the test fuel, cut a representative piece of 2 x 4 or 4 x 4 that is approximately 3 to 5-inches in length.

B. Take a moisture reading from the top, bottom and side of the piece. Record readings on Data Sheet #11. Determine the % moisture on a wet and dry basis.

C. Weight the piece on a balance.

D. Take measurements of width, depth and length at the four corners with a micrometer. Determine the volume of the piece. (Length x width x depth = Volume in cubic centimeters)

E. Dry the piece in an oven at 95-100 °C for a minimum of 24 hours.

F. Reweigh the piece on the balance.

G. Calculate % moisture on a dried basis.

$$\%\ \text{moisture (dry basis)} = 1 - \frac{\text{dried weight}}{\text{wet weight}} * 100$$

H. Calculate the density.

$$\text{Density (g / cc)} = \frac{\text{dried weight (g)}}{\text{volume (cc)}}$$

BTU'S/LB DETERMINATION

A. When cutting the test fuel (only the test fuel, not the kindling, pretest fuel or spacers), collect a sawdust sample. Place in a clearly marked plastic bag.

B. Forward sample to a commercial laboratory for BTU contents analysis.

STOVE PREPARATION

A. Clean the stove.

B. Weigh the stove, record the weight on Data Sheet #8.

C. Add approximately 0.3 lb. of wadded newspaper to the stove. Record weight of newspaper on Data Sheet #8. Add 4-8 lb. of kindling to the stove, and record the weight of the kindling on Data Sheet #8.

D. Light the paper and kindling, leaving the stove's air draft control(s) wide open and the door cracked until well ignited.

E. Close door.

F. When between 50% - 75% of the weight of the kindling has been burned add the first pretest fuel charge.

G. Continue to add pretest fuel until the stove has thoroughly warmed up. As necessary, rake the coal bed prior to adding additional pretest fuel charges.

H. Remove all material from the firebox after two or more hours of burning on high. Obtain the dry empty stove weight and record on Data Sheet #8.

I. Set the stove's air draft control(s) at the desired setting a minimum of 1 hour before the test run is to begin.

J. As necessary set the heat exchange blower(s) at the specified setting a minimum of one hour before the test is to begin.

K. Record the stove surface temperatures, firebox and post catalytic or secondary burn temperatures and scale weigh for a minimum of one hour before the test run begins. As necessary add fuel, rake the coal bed, level the coal bed and/or remove coals during the first 45 minutes of the hour immediately preceding the start of the test. Record all information concerning raking, fuel additions, etc. on Data Sheet #13.

L. If necessary, sometime during the last 15 minutes before the start of the test, open the door and brake up all large pieces and then rake and level the pretest fuel in the stove. At this time, level the coal bed as necessary to accommodate loading the fuel charge into the stove. Close the door. Total time door can be open during the last 15 minutes is 1 minute. No further manipulation of the stove is allowed during the 15 minutes immediately preceding the start of the test.

M. When the weight of the coal bed equals 20-25% of the weight of the test fuel charge, load the test fuel. Take a photograph of the fuel load in the stove immediately after loading the fuel. Leave the door open as per the manufacturer's instruction, but no longer than 5 minutes.

N. Document all stove operating data from ignition through loading and test start up on Data Sheet #9.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Model C350
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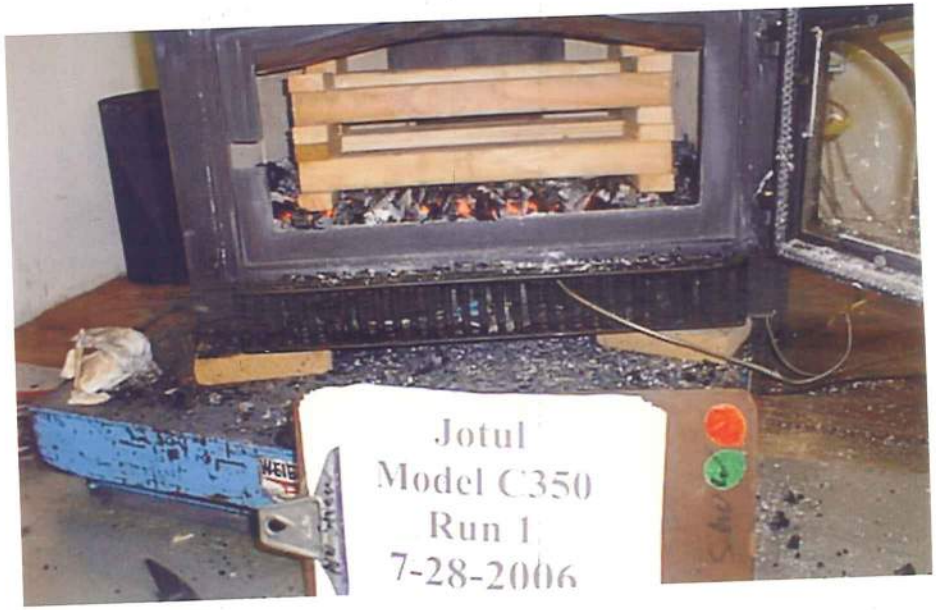
Jotul
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Run 1
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Run 2
7-29-2006


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Run 3
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Run 4
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Run 4
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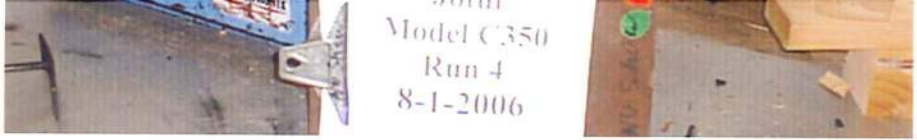
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